

LEHIGH UNIVERSITY PUBLICATION

UNIVERSITY
CATALOG

MARCH
1951





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1951/52
Dep. 1

Lehigh University Publication

VOL. 25

MARCH, 1951

No. 2

CATALOG 1951-1952



BETHLEHEM, PENNSYLVANIA

Published quarterly during the calendar year by Lehigh University, Bethlehem, Pennsylvania. Entered as second class matter March 24, 1927, at the Post Office at Bethlehem, Pennsylvania, under the Act of August 24, 1912.

LEHIGH UNIVERSITY

1950							1951							1952						
JULY							JANUARY							JULY						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
..	..	..	..	..	..	1	..	1	2	3	4	5	6	1	2	3	4	5	6	7
2	3	4	5	6	7	8	7	8	9	10	11	12	13	8	9	10	11	12	13	14
9	10	11	12	13	14	15	14	15	16	17	18	19	20	15	16	17	18	19	20	21
16	17	18	19	20	21	22	21	22	23	24	25	26	27	22	23	24	25	26	27	28
23	24	25	26	27	28	29	28	29	30	31	..	..	..	29	30	31	..	..	..	..
30	31	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
31	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
AUGUST							FEBRUARY							AUGUST						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
..	..	1	2	3	4	5	..	..	..	..	1	2	3	..	..	..	..	..	1	2
6	7	8	9	10	11	12	4	5	6	7	8	9	10	5	6	7	8	9	10	11
13	14	15	16	17	18	19	11	12	13	14	15	16	17	12	13	14	15	16	17	18
20	21	22	23	24	25	26	18	19	20	21	22	23	24	19	20	21	22	23	24	25
27	28	29	30	31	..	..	25	26	27	28	..	..	..	26	27	28	29	30	31	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
SEPTEMBER							MARCH							SEPTEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
..	..	..	..	..	1	2	..	..	..	..	..	1	2	..	..	..	..	..	1	2
3	4	5	6	7	8	9	4	5	6	7	8	9	10	2	3	4	5	6	7	8
10	11	12	13	14	15	16	11	12	13	14	15	16	17	9	10	11	12	13	14	15
17	18	19	20	21	22	23	18	19	20	21	22	23	24	16	17	18	19	20	21	22
24	25	26	27	28	29	30	25	26	27	28	29	30	31	23	24	25	26	27	28	29
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..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
OCTOBER							APRIL							OCTOBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1	2	3	4	5	6	7	1	2	3	4	5	6	7	..	1	2	3	4	5	6
8	9	10	11	12	13	14	8	9	10	11	12	13	14	7	8	9	10	11	12	13
15	16	17	18	19	20	21	15	16	17	18	19	20	21	14	15	16	17	18	19	20
22	23	24	25	26	27	28	22	23	24	25	26	27	28	21	22	23	24	25	26	27
29	30	31	..	..	..	..	29	30	..	..	..	..	..	28	29	30	31	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
NOVEMBER							MAY							NOVEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
..	..	..	1	2	3	4	..	..	1	2	3	4	5	..	..	..	..	1	2	3
5	6	7	8	9	10	11	6	7	8	9	10	11	12	4	5	6	7	8	9	10
12	13	14	15	16	17	18	13	14	15	16	17	18	19	11	12	13	14	15	16	17
19	20	21	22	23	24	25	20	21	22	23	24	25	26	18	19	20	21	22	23	24
26	27	28	29	30	..	..	27	28	29	30	31	..	..	25	26	27	28	29	30	31
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
DECEMBER							JUNE							DECEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
..	..	..	..	..	1	2	..	..	..	..	..	1	2	..	1	2	3	4	5	6
3	4	5	6	7	8	9	3	4	5	6	7	8	9	2	3	4	5	6	7	8
10	11	12	13	14	15	16	10	11	12	13	14	15	16	9	10	11	12	13	14	15
17	18	19	20	21	22	23	17	18	19	20	21	22	23	16	17	18	19	20	21	22
24	25	26	27	28	29	30	24	25	26	27	28	29	30	23	24	25	26	27	28	29
31	..	..	..	..	..	..	..	..	..	..	..	..	..	30	31	..	..	..	..	..

University Calendar

1950-1952

1950

September 11, 3:00 P.M. (Mon.)	First faculty meeting
September 12 (Tues.)	Freshman week begins
September 12-16 (Tues.-Sat.)	Make-up and special examinations
September 18, 19, 20 (Mon.-Wed.)	Registration for fall semester
September 21 (Thurs.)	Fall semester instruction begins
October 2 (Mon.)	Last day on which registration for fall courses will be permitted
October 8 (Sun.)	Founder's Day
November 16 (Thurs.)	Mid-semester reports due
November 22, 10:00 P.M. (Wed.)	Thanksgiving vacation begins
November 27, 8:10 A.M. (Mon.)	Thanksgiving vacation ends
December 20, 10:00 P.M. (Wed.)	Christmas vacation begins

1951

January 4, 8:10 A.M. (Thurs.)	Christmas vacation ends
January 13 (Sat.)	Last day of classes for Arts seniors taking comprehensive examinations
January 17, 18, 19, 20 (Wed.-Sat.)	Comprehensive examinations for Arts seniors
January 20 (Sat.)	Last day of classes in fall semester
January 22 (Mon.)	Examinations begin
January 31 (Wed.)	Examinations end
February 5, 6, 7 (Mon.-Wed.)	Registration for spring semester
February 8 (Thurs.)	Spring semester instruction begins
February 19 (Mon.)	Last day on which registration for spring courses will be permitted
February 22 (Thurs.)	Language Requirement Examinations for candidates for Ph.D. degree
March 31, 12:00 A.M. (Sat.)	Spring vacation begins
April 2 (Mon.)	Mid-semester reports due
April 9, 8:10 A.M. (Mon.)	Spring vacation ends
May 15 (Tues.)	Last day for filing applications for degrees to be conferred in June
May 23 (Wed.)	Last day of classes for Arts seniors taking comprehensive examinations
May 30 (Wed.)	Last day of classes in spring semester
May 31 (Thurs.)	Course examinations begin
June 12 (Tues.)	Course examinations end
June 17 (Sun.)	Baccalaureate Sunday
June 18 (Mon.)	University Day
June 19 (Tues.)	Registration for undergraduate and graduate summer session
June 20 (Wed.)	Undergraduate instruction begins. Registration for graduate summer session.
June 21 (Thurs.)	Graduate instruction begins
June 25 (Mon.)	Last day on which registration for summer session will be permitted. Three-week and five-week workshop instruction begins. Registration for three- and five-week workshops.
July 2 (Mon.)	Registration for four-week undergraduate session for incoming freshmen
July 3 (Tues.)	Classes start for four-week undergraduate session for incoming freshmen

LEHIGH UNIVERSITY

July 14 (Sat.)	Three-week workshop ends
July 27 (Fri.)	First six-week undergraduate session ends
July 28 (Sat.)	Five-week workshop ends
July 30 (Mon.)	Registration for second six-week session for undergraduates
July 31 (Tues.)	Instruction begins for second six-weeks summer session
August 1 (Wed.)	Graduate summer session ends
August 2 (Thurs.)	Post session begins
August 18 (Sat.)	Post session ends
September 3 (Mon.)	Holiday
September 7 (Fri.)	Second six-weeks session ends
September 8 (Sat.)	Last day for filing applications for degrees to be conferred on Founder's Day
September 10, 3:00 P.M. (Mon.)	First faculty meeting
September 11 (Tues.)	Freshman week begins
September 11-15 (Tues.-Sat.)	Make-up and special examinations
September 17, 18, 19 (Mon.-Wed.)	Registration for fall semester
September 20 (Thurs.)	Fall semester instruction begins
October 1 (Mon.)	Last day on which registration for fall courses will be permitted
October 14 (Sun.)	Founder's Day
November 15 (Thurs.)	Mid-semester reports due
November 21, 10:00 P.M. (Wed.)	Thanksgiving vacation begins
November 26, 8:10 A.M. (Mon.)	Thanksgiving vacation ends
December 19, 10:00 P.M. (Wed.)	Christmas vacation begins

1952

January 3, 8:10 A.M. (Thurs.)	Christmas vacation ends
January 12 (Sat.)	Last day of classes for Arts seniors taking comprehensive examinations
January 16-19 (Wed.-Sat.)	Comprehensive examinations for Arts seniors
January 19 (Sat.)	Last day of classes in fall semester
January 21 (Mon.)	Course examinations begin
January 30 (Wed.)	Course examinations end
February 4, 5, 6 (Mon.-Wed.)	Registration for spring semester
February 7 (Thurs.)	Spring semester instruction begins
February 18 (Mon.)	Last day on which registration for spring courses will be permitted
March 31 (Mon.)	Mid-semester reports due
April 5, 12:00 M. (Sat.)	Spring vacation begins
April 14, 8:10 A.M. (Mon.)	Spring vacation ends
May 13 (Tues.)	Last day for filing applications for degrees to be conferred in June
May 21 (Wed.)	Last day of classes for Arts seniors taking comprehensive examinations
May 28 (Wed.)	Last day of classes in spring semester
May 29 (Thurs.)	Course examinations begin
June 10 (Tues.)	Course examinations end
June 15 (Sun.)	Baccalaureate Sunday
June 16 (Mon.)	University Day

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*Died June 8, 1950

†On leave December 1, 1950

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*Resigned August 31, 1950

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†Resigned July 31, 1950

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(The first date after the name indicates date of first appointment to continuous service on the faculty or staff; the second date, when the first fails to do so, indicates the date of appointment to present classification as to professional rank.)

- WILLIAM APPLETON AIKEN (1941, 1948) *Professor of History*
B.A., Yale, 1929; M. Litt., Cambridge, 1932; Ph.D., Yale, 1939.
- CARL ELMER ALLEN (1930, 1949)..... *Professor of Accounting,*
Director of the Curriculum in Business Administration, Dean of the
College of Business Administration.
B.S., Illinois, 1923; M.S., 1925; Ph.D., 1930; C.P.A., Pennsylvania, 1939.
- EDWARD DELBERT AMSTUTZ (1938, 1947)..... *Professor of Organic*
Chemistry
B.S., College of Wooster, 1930; M.S., Institute of Paper Chemistry, 1932; Ph.D., Cornell, 1936.
- HAROLD VICTOR ANDERSON (1918, 1941)..... *Professor of Chemistry*
B.Ch.E., Michigan, 1912; M.S., Lehigh, 1925.
- FRED GARTIN ARMSTRONG (1947, 1950) *Assistant Professor of*
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B.S., Ball State Teachers College, 1941; M.A. 1946.
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B.A., Williams, 1930; B.A., Oxford, 1932; M.A., 1936; Ph.D., Columbia, 1941.
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B.S. in C.E., Lehigh, 1942.
- CHARLES KELLEY BAKER, JR. (1950)..... *Associate Professor of Air*
Science and Tactics
Ph.D., Brown, 1926; Major, USAF.
- RICHARD ALAN BAKER (1929)..... *Research Assistant in Chemistry*
B.S. in Ch.E., Lehigh, 1949.
- LUCILE LEWIS BARRETT (1944)..... *Assistant University News Editor*
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B.A., Lehigh, 1921; Ph.D., Yale, 1931.
- FAY CONANT BARTLETT (1917, 1921)..... *Assistant Professor of*
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- LESTER RAY BARTRON (1947)..... *Research Assistant in Chemistry*
B.S. in Ch.E., Lehigh, 1947; M.S., 1949.
- WILLIAM RUSSELL BASTIAN (1949)..... *Instructor in Industrial*
Engineering
B.S., Pennsylvania State College, 1947.
- JEAN LOUISE BAUDER (1950)..... *Third Assistant Cataloguer*
B.S., Kutztown State Teachers College, 1950.
- PAUL LEVERNE BAYLEY (1927, 1937)..... *Professor of Physics*
B.A., Arkansas, 1913; M.A., Illinois, 1914; Ph.D., Cornell, 1923.

FACULTY AND STAFF

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- FRANK SWAN BEALE (1930, 1949)..... *Associate Professor of Mathematics*
B.S., Maine, 1921; M.S., 1923; Ph.D., Michigan, 1931.
- GEORGE MARTIN BEAN (1946)..... *Assistant Professor of Religion, Chaplain of the University*
B.S., Virginia, 1939; B.D., Virginia Theological Seminary, 1942.
- CLAUDE GILLETTE BEARDSLEE (1931, 1947)..... *Professor Emeritus of Moral and Religious Philosophy*
B.A., Yale, 1909; B.D., Hartford Theological Seminary, 1912; S.T.M., 1913; M.A., Southern California, 1922; Ph.D., Brown, 1931.
- †JAMES MERCER BEAUCHAMP, JR., (1946, 1949)..... *Assistant Professor of Industrial Engineering*
B.S. in I.E., Lehigh, 1941; M.S., 1948.
- JACOB LYNFORD BEAVER (1917, 1931)..... *Professor of Electrical Engineering*
E.E., Lehigh, 1904; M.S., 1921; ScD., Harvard, 1932.
- GEORGE CARLTON BECK (1904, 1946)..... *Assistant Professor Emeritus of Quantitative Analysis*
A.C., Lehigh, 1903.
- FRANK CHESTER BECKER (1927, 1950)..... *Associate Professor Emeritus of Philosophy*
A.B., Wesleyan, 1905.
- SYLVANUS A. BECKER (1906, 1944)..... *Associate Professor Emeritus of Civil Engineering*
C.E., Lehigh, 1903; M.S., 1909.
- LYNN SIMPSON BEEDLE (1947, 1950)..... *Assistant to the Director, Fritz Laboratory*
B.S. in C.E., California (Berkeley), 1941.
- FERDINAND PIERRE BEER (1947, 1948)..... *Associate Professor of Mechanics*
B.S., Geneva (Switzerland), 1933; M.A., 1935; Ph.D., 1937; M.A., Paris, 1938.
- LOUIS WALTER BENDER (1950)..... *Graduate Assistant in Education*
A.B., Moravian, 1950.
- RUSSELL EDWARD BENNER (1949)..... *Instructor in Mechanical Engineering*
B.M.E., Cornell, 1947; B.S. in M.E., Univ. of Pa., 1949.
- JOHN BEREZNAK, JR., (1946)..... *Assistant in Air Science and Tactics*
Master Sergeant, U.S.A.
- LOYAL VIVIAN BEWLEY (1940)..... *Professor of Electrical Engineering, Head of the Department of Electrical Engineering, Director of the Curriculum in Electrical Engineering*
B.S. in E.E., Washington, 1923; M.S., Union, 1928.
- AUBERT HOLMES BIBOLET (1950)..... *Research Assistant in Chemistry*
B.A., Rutgers, 1950.
- CHARLES CLARENCE BIDWELL (1927, 1947)..... *Professor Emeritus of Physics*
A.B., Rochester, 1904; Ph.D., Cornell, 1914.
- ROBERT DOMINICK BILLINGER (1929, 1939)..... *Associate Professor of Chemistry*
Ch.E., Lehigh, 1921; M.S., 1925; Ph.D., Cincinnati, 1929.

*Transferred February 1, 1951.

†Resigned January 31, 1951.

- ALBERT LAWRENCE BLAKERS (1949) *Assistant Professor of Mathematics*
B.Sc., University of Western Australia, 1938; M.A., Princeton, 1942; Ph.D., 1947.
- EDMUND MOODY BLANKEN, JR. (1950) *Graduate Assistant in Chemistry*
B.S., Brown, 1950.
- SIDNEY ARNOLD BLUDMAN (1950) *Instructor in Physics*
A.B., Cornell, 1945; M.S., Yale 1948.
- ALEXANDER FRANCIS BODNER (1948) *Technician, Department of Public Relations*
- ELIZABETH JANE BORDNER (1948, 1949) *First Assistant Cataloguer*
B.S. in Ed., Kutztown State Teachers College, 1945.
- HARRY T. BOUTSIKARIS (1950) *Fencing Coach*
- HENRY DEIFER BOWEN, JR. (1950) *Research Assistant in Chemistry*
B.S., Lehigh, 1950.
- DELBERT ALFRED BOWMAN (1950) *Graduate Assistant in Geology*
B.S., Brooklyn College, 1949.
- JULIAN WARREN BRADBURY (1950) *Assistant Professor of Air Science and Tactics*
Captain, USAF.
- FREDERICK ALDEN BRADFORD (1926, 1935) *Professor of Economics, Head of the Department of Finance*
A.B., Michigan, 1921; M.A., 1923; Ph.D., 1926.
- ELMER CLARK BRATT (1929, 1941) *Professor of Economics*
A.B., Nebraska, 1925; A.M., 1926; Ph.D., Wisconsin, 1935.
- ROBERT ALLEN BREAM (1947) *Associate Professor of Education*
B.S., Gettysburg, 1929; M.A., Columbia, 1933; Ed.D., Pennsylvania State, 1943.
- ANTHONY JOSEPH BRYSKI (1947) *Instructor in Economics and Sociology*
B.S., Temple, 1940; M.A., New York University, 1947.
- PAUL PHILIP BUDENSTEIN (1949) *Graduate Assistant in Physics*
B.S., Temple, 1949.
- RAYMOND COOLEY BULL (1923, 1944) *Director Emeritus of the Students' Health Service*
B.S., Colorado College, 1904; A.B., Kansas, 1906; M.D., Jefferson Medical College, 1909.
- ALBERT SEM BURALLI (1949) *Graduate Assistant in Chemistry*
B.S., Moravian, 1949.
- ELDRED LEE BURKHARD (1949) *Graduate Assistant in Physics*
B.S., Nebraska Wesleyan, 1949.
- THOMAS EDWARD BUTTERFIELD (1912, 1944) *Professor Emeritus of Heat Power Engineering*
M.E., Stevens Institute of Technology, 1895; C.E., Rensselaer Polytechnic Institute, 1897.
- ALLISON BUTTS (1916, 1938) *Professor of Electrometallurgy*
A.B., Princeton, 1911; B.S., Massachusetts Institute of Technology, 1913.
- ROBERT HAROLD BYINGTON (1950) *Graduate Assistant in English*
A.B., Pennsylvania State College, 1950.

FACULTY AND STAFF

- THOMAS JOSEPH BYRNE (1949)..... *Research Assistant in Chemistry*
B.S., Providence, 1949.
- ALFRED COPELAND CALLEN (1939)..... *Professor of Mining Engineering, Head of the Department of Mining Engineering, Director of the Curriculum in Mining Engineering*
E.M., Lehigh, 1909; M.S., 1911.
- CLARENCE BOWEN CAMPBELL (1947, 1950)..... *Acting Director of Admissions*
B.A., Temple, 1937; M.A., Lehigh, 1947.
- ELBERT FRANCIS CARAWAY (1941, 1946)..... *Assistant Professor of Physical Education, Assistant Director of Athletics, Coach of Baseball*
B.S., Purdue, 1930.
- NEIL CAROTHERS (1923, 1949)..... *Dean Emeritus of College of Business Administration*
B.A., Arkansas, 1905; Dip. in Econ., Oxford, 1907; Ph.D., Princeton, 1916.
- GERALD VINCENT CARROLL (1950)..... *Instructor in Geology.*
B.A., Lehigh, 1943; Ph.D., Yale, 1950.
- HENRI ROBERT CHALOS (1950)..... *Graduate Assistant in Romance Languages*
A.B., Harvard, 1950.
- JOHN OLSON CHELLEVOLD (1946)..... *Assistant Professor of Mathematics*
A.B., St. Olaf, 1927; M.A., Northwestern, 1929.
- ELLIOTT WARD CHENEY (1942)..... *Associate Professor of Physics*
A.B., Dartmouth, 1920; M.S., Brown, 1925; Ph.D., Princeton, 1929.
- WALTER GRANVILLE CHESNUT (1950)..... *Graduate Assistant in Physics*
B.S., Lehigh, 1950.
- JOHN JOSEPH CHESICK (1948)..... *Graduate Assistant in Chemistry*
B.S., Pennsylvania State, 1948.
- MINCHEN MING CHOW (1950)..... *Research Assistant in Geology*
B.Sc., National University of Chungking, China 1943; M.A., Miami University (Ohio) 1948.
- GLENN JAMES CHRISTENSEN (1939, 1946)..... *Associate Professor of English*
B.A., College of Wooster, 1935; Ph.D., Yale, 1939.
- WILLIAM CHRISTIAN (1947, 1949)..... *Assistant Professor of Physical Education, Coach of Varsity Swimming, Assistant Coach of Football and Baseball*
B.S. in Ed., New Jersey State Teachers College (Trenton), 1939.
- JOHN ALLAN CHRISTIE (1951)..... *Graduate Assistant in International Relations*
A.B., Lehigh, 1948.
- JOSEPH MICHAEL CLIFFORD, JR. (1948)..... *Graduate Assistant in Physics*
A.B., Harvard, 1948.
- WILLIAM HILLICK CLOHESSY (1950)..... *Instructor in Physics*
B.S., Queens College, 1944; Ph.D., Cornell, 1948.
- REUBEN HARVEY CLOSE (1948)..... *Instructor in Electrical Engineering*
B.S. in Ed., Pennsylvania State Teachers College (Mansfield), 1936; E.E., Cornell, 1940.
- JACK ELI COLE (1948)..... *Assistant Director of the Students' Health Service*
B.S., Pennsylvania State, 1937; M.D., Pennsylvania, 1941.

- HERMAN EDWARD COLLIER, JR. (1950) *Graduate Assistant in Chemistry*
B.S., Randolph-Macon, 1950.
- WRAY HOLLOWELL CONGDON (1934, 1938) *Professor of Education,*
Dean of Students, Director of Personnel Services
A.B., Syracuse, 1914; M.A. (Engl.), 1915; M.A. (Ed.), Michigan, 1922; Ph.D., 1929.
- MICHAEL THOMAS COOLEY (1950) *Assistant Football Coach*
B.A., University of Georgia.
- FRANCIS LOUIS COSTA (1949) *Graduate Assistant in Civil*
B.C.E., Manhattan, 1949. *Engineering*
- ERNEST FRANCIS COSTELLO, JR. (1949) *Graduate Assistant in Physics*
A.B., Boston University, 1949.
- RAYMOND GIBSON COWHERD (1946) *Assistant Professor of History*
A.B., William Jewell, 1933; M.A., Pennsylvania, 1936; Ph.D., 1940.
- ROY BURFORD COWIN (1924) *Professor of Accounting,*
Head of the Department of Accounting
A.B., Michigan, 1916; M.A., 1918.
- GRACE IRENE CREITZ (1950) *Research Assistant in Chemistry*
B.A., Cedar Crest, 1950.
- ROBERT ELWOOD CRISPEN (1946, 1949) *Assistant Professor of Civil*
B.S. in C.E., Lehigh, 1937. *Engineering*
- CLOYD CRISWELL (1947, 1949) *Assistant Professor of English*
B.S. in Ed., Pennsylvania State Teachers College (Millersville), 1933; M.A., New York University, 1937.
- EARL LEVERNE CRUM (1929, 1950) *Professor of Classical*
Languages, Head of the Department of Classical Languages
A.B., St. John's (Annapolis), 1913; A.M., Johns Hopkins, 1916; Ph.D., New York, 1924; Ehrensensator, Heidelberg, 1949.
- CASSIUS WILD CURTIS (1946, 1948) *Professor of Physics*
A.B., Williams, 1928; Ph.D., Princeton, 1936.
- EDWARD HUTCHINS CUTLER (1930, 1947) *Associate Professor of*
A.B., Harvard, 1925; A.M., 1926; Ph.D., 1930. *Mathematics*
- EDWARD NELSON DANES (1949) *Graduate Assistant in*
B.S., Lehigh, 1949. *Chemistry and Chemical Engineering*
- JOHN DANIEL (1946) *Graduate Assistant in History*
Dipl., Concordia Theological Seminary (Missouri), 1936; M.A., Lehigh, 1947.
- H. BARRETT DAVIS (1946) *Associate Professor of Speech*
B.L.I., Emerson, 1929; Cert. American Academy of Dramatic Arts, 1930.
- RICHARD MALONE DAVIS (1941, 1947) *Assistant Professor of*
A.B., Colgate, 1939; M.A., Cornell, 1941; Ph.D., 1949. *Economics*
- EDNA VIRGINIA DEAN (1925) *Secretary to the Treasurer*
- JOHN WEERT DEGROOT, JR. (1948) *Research Assistant in Chemistry*
B.S., Dickinson, 1948.
- ALBERT DENEUFVILLE (1948) *Instructor in Mechanics*
Dipl. Eng., Berlin, 1922; M.S., Stevens Institute of Technology, 1948.
- WILLIAM KENNETH DETWEILER (1949) *Research Assistant in*
B.S. in Chem., Ursinus, 1947; M.S., Lehigh, 1949. *Chemistry*

FACULTY AND STAFF

- HERBERT MAYNARD DIAMOND (1927).....*Professor of Economics,
Head of the Department of Economics and Sociology*
B.A., Yale, 1914; Ph.D., 1917.
- ALPHA ALBERT DIEFENDERFER (1902, 1946).....*Professor Emeritus of
Quantitative Analysis and Assaying*
B.S. in Chem., Lehigh, 1902; M.S., 1908.
- ERNEST NEVIN DILWORTH (1949).....*Assistant Professor of English*
Ph.B., Kenyon, 1933; M.A., University of Pittsburgh, 1937; Ph.D., Columbia,
1948.
- JOHN WALTON DIXON (1949).....*Instructor in Accounting*
B.A., Harvard, 1943; M.B.A., Columbia, 1948.
- GILBERT EVERETT DOAN (1926, 1937).....*Professor of Metallurgy,
Head of the Department of Metallurgical Engineering, Director of
the Curriculum in Metallurgical Engineering*
Ch.E., Lehigh, 1919; Ph.D., Berlin, 1926.
- DAVID DOCKHAM (1947, 1949).....*Assistant Professor of
Physical Education, Coach of Lacrosse, Assistant Coach of Football
and Swimming*
B.S. in Phys. Ed., Springfield, 1943.
- RANDOLPH PETER DOMINIC (1949).....*Instructor in Mechanical
Engineering*
B.S., Rensselaer Polytechnic Institute, 1945.
- CLARENCE HARRY DOMM (1950).....*Graduate Assistant in English*
A.B., Ursinus, 1950.
- WILLIS LYLE DONALDSON (1946).....*Assistant Professor of
Electrical Engineering*
B.S. in E.E., Texas Technological College, 1938.
- ROBERT ERWIN DONEY (1949, 1950).....*Instructor in Fine Arts*
- GEORGE CLARENCE DRISCOLL, JR. (1950).....*Graduate Assistant in
Civil Engineering*
B.S. in C.E., Rutgers, 1950.
- GARSTON WALLACE DRIVER, JR. (1949).....*Assistant in Charge of
Publications*
- GENEVIEVE ELEANOR DUGAN (1949).....*Graduate Assistant in
Psychology*
B.S., University of Pennsylvania, 1948.
- AURIE NICHOLAS DUNLAP (1948).....*Assistant Professor of
International Relations*
A.B., Union (New York), 1929; A.M., Columbia, 1931.
- PETER STURGES EAGLESON (1950).....*Graduate Assistant in Civil
Engineering*
B.S. in C.E., Lehigh, 1949.
- NELSON ROY EASTON (1947).....*Assistant Professor of Chemistry*
A.B., Middlebury, 1941; Ph.D., Illinois, 1946.
- THOMAS SPICER EICHELBERGER (1950).....*Instructor in Mechanical
Engineering*
B.E. in E.E., Johns Hopkins, 1943; B.E. in M.E., 1947; M.S. in M.E., 1950.
- RAYMOND JAY EMRICH (1946, 1949).....*Associate Professor of Physics*
B.S., Princeton, 1938; Ph.D., 1946.
- JACK EMRICK (1948).....*Assistant Professor of Air Science and Tactics*
Capt., U.S.A.

- JAMES VANDEUSEN EPPES (1940, 1950) *Associate Professor of Mechanical Engineering*
B.A., Virginia, 1928; M.E., Cornell, 1931; M.S. in M.E., Lehigh, 1943.
- WILLIAM JOSEPH ENEY (1936, 1946) *Professor of Civil Engineering, Head of the Department of Civil Engineering and Mechanics, Director of Fritz Engineering Laboratory, Director of the Curriculum in Civil Engineering*
B.E., Johns Hopkins, 1927; M.S., Lehigh, 1938.
- SAMUEL JOSEPH ERRERA (1951) *Engineer of Tests, Fritz Engineering Laboratory*
B.S. in C.E., Rutgers, 1949.
- EPHRAIM BRYSON EVERITT (1948) *Assistant Professor of English*
B.A., Pennsylvania State, 1925; M.A., 1928.
- S. BLAINE EWING (1946, 1947) *Associate Professor of English*
A.B., Princeton, 1927; M.A., 1928; Ph.D., 1934.
- WARREN WALTER EWING (1920, 1937) *Professor of Physical Chemistry*
B.S., Parsons, 1912; M.S., Chicago, 1918; Ph.D., 1920.
- GEORGE DORMER FARNE (1934, 1945) *Assistant Professor of Romance Languages*
A.B., Columbia, 1926; M.A., 1927.
- EDWARD JOSEPH FARRELL (1948) *Assistant to the Superintendent of Buildings and Grounds*
- JOSEPH VINCENT FEDOR (1950) *Graduate Assistant in Mechanical Engineering*
B.S., University of Connecticut, 1950.
- JACQUELINE MARIE FETSKO (1950) *Research Assistant in Chemistry*
B.A., University of Pennsylvania, 1946.
- SHELDON FINKLER (1950) *Graduate Assistant in Chemical Engineering*
B.S., Virginia Polytechnic Institute, 1950.
- VELMER BERNEL FISH (1948) *Assistant Professor of Chemistry*
B.S., Iowa State, 1936; Ph.D., 1942.
- ANNE STROWD FLANNERY (1947, 1948) *Head Cataloguer*
A.B., Duke, 1934; A.B. in L.S., Emory, 1942; M.A., Duke, 1945.
- ERNEST GUNTER FONTHEIM (1950) *Graduate Assistant in Physics*
A.B. and B.S., Southwest Missouri State, 1950.
- ADELBERT FORD (1931) *Professor of Psychology, Head of the Department of Psychology*
A.B., Michigan, 1920; A.M., 1923; Ph.D., 1926.
- FRANK JUNIOR FORNOFF (1940, 1947) *Associate Professor of Chemistry*
A.B., Illinois, 1936; M.S., Ohio State, 1937; Ph.D., 1939.
- RICHARD WILLIAM FOUNTAIN (1949) *Research Assistant in Metallurgy*
B.S., Notre Dame, 1947.
- GEORGE ROY FOX (1950) *Graduate Assistant in Physics*
B.S., Iowa State, 1950.
- PAUL JUSTUS FRANZ, JR. (1944, 1949) *Assistant to the President*
B.S. in Bus. Adm., Lehigh, 1944.

FACULTY AND STAFF

- HERBERT WARD FRASER (1950).....*Instructor in Economics*
A.B., Swarthmore, 1943; M.A., Princeton, 1949.
- PAUL FRED FREED (1950).....*Graduate Assistant in Reading Clinic*
B.A., Muhlenberg
- ROBERT BASS FREEMAN (1949).....*Research Assistant in Chemistry*
B.S., Muhlenberg, 1949.
- AUGUSTUS HENRY FRETZ (1918, 1948).....*Associate Professor*
Ph.B., Lafayette, 1903; C.E., 1906; M.S., 1924. *Emeritus of Geology*
- MERTON OTIS FULLER (1912, 1922).....*Associate Professor of Civil*
C.E., Syracuse, 1910; M.S., Lehigh, 1934. *Engineering*
- FRANK ELMER FUNK (1949).....*Instructor in Speech*
B.S., Syracuse, 1949.
- ROBERT TAYLOR GALLAGHER (1942, 1950).....*Professor of Mining*
Engineering
B.S., Pennsylvania State, 1927; M.A., Missouri, 1938; D.E.M., Colorado School of Mines, 1941.
- ERNEST GAMBLE, JR. (1946).....*Research Assistant in Chemistry*
B.S. in Ch.E., Lehigh, 1942; M.S., 1947.
- GEORGE LEWIS GANSZ (1948, 1949).....*Instructor in Music*
B.S., Temple, 1948.
- DONALD GRAEME GARDNER (1949).....*Graduate Assistant in*
Chemistry and Chemical Engineering
A.B., Princeton, 1948.
- HUGH RICHARD GAULT (1946, 1948).....*Associate Professor of Geology*
A.B., DePaw, 1936; M.A., Missouri, 1938; Ph.D., Johns Hopkins, 1942.
- BENJAMIN GEBHART (1950).....*Instructor in Mechanical Engineering*
B.S.E., Mech. Engr., University of Michigan, 1948; M.S.E., Mech. Engr., University of Michigan, 1950.
- PHILIP HOWARD GEISLER (1950).....*Graduate Assistant in Biology*
A.B., Lehigh, 1950.
- JACK EMMANUEL GELFAND (1949).....*Instructor in Economics*
B.A., Brooklyn, 1943; M.A., 1948.
- JOSEPH ANTHONY GIGLIOTTI (1949, 1950).....*Graduate Assistant*
B.S. in C.E., University of Pittsburgh, 1949. *in Civil Engineering*
- LEANOR RUTH GILBERT (1930, 1943).....*Recorder*
- LAWRENCE HENRY GIPSON (1924, 1946).....*Research Professor of History*
A.B., Idaho, 1903; B.A., Oxford, 1907; Ph.D., Yale, 1918; Litt.D., Temple, 1947.
- ELMER WILLIAM GLICK (1949).....*Assistant to the Treasurer*
B.A., Lehigh, 1933.
- WILSON LEON GODSHALL (1939, 1947).....*Professor of International*
Relations, Head of the Department of International Relations
B.S., Pennsylvania, 1919; A.M., 1920; Ph.D., 1923.
- SAMUEL GOLDBERG (1950).....*Instructor in Mathematics*
B.S., College of the City of New York, 1944; Ph.D., Cornell, 1950.

LEHIGH UNIVERSITY

- ARTHUR FREEMAN GOULD (1947, 1951)..... *Associate Professor of Industrial Engineering*
S.B., Massachusetts Institute of Technology, 1938; M.S., Lehigh, 1949.
- RALPH SCHULTZ GRABER (1946, 1948)..... *Instructor in English*
B.A., Lehigh, 1946; M.A., 1948.
- JAMES LARMOUR GRAHAM (1930, 1938)..... *Associate Professor of Psychology*
B.A., Muskingum, 1911; B.D., Union Theological Seminary, 1922; M.A., Columbia, 1922; Ph.D., Peabody, 1927.
- THOMAS HUTCHESON GRAINGER (1946, 1949)..... *Associate Professor of Bacteriology*
B.A., Lehigh, 1936; M.S., 1938; Ph.D., 1946.
- MARY CLARA GRAVEZ (1948)..... *Reference Librarian*
B.S., Valparaiso, 1913.
- DONALD CARSON GREY (1950)..... *Graduate Assistant in Physics*
B.S., University of Wyoming, 1950.
- ANDREW J. GRIEST, JR. (1950)..... *Research Assistant in Metallurgy*
B.S., Rensselaer Polytechnic Institute, 1950.
- JOHN HAMMES GROSS (1946, 1947)..... *Instructor in Metallurgy*
B.S. in Met.E., Lehigh, 1944; M.S., 1948.
- NATHAN B. GROSS (1946, 1947)..... *Assistant Professor of Psychology*
B.S., Chicago, 1938; M.S., Rochester, 1943; Ph.D., 1946.
- HOWARD DIETRICH GRUBER (1914, 1948)..... *Associate Professor of Electrical Engineering*
E.E., Lehigh, 1909; M.S., 1923.
- ADOLF GRÜNBAUM (1950)..... *Instructor in Philosophy*
B.A., Wesleyan, 1943; M.S., Yale, 1948; Ph.D., Yale, 1950.
- NATHANIEL ELLMAKER HAGER, JR. (1947)..... *Instructor in Physics*
B.S., Franklin and Marshall, 1943; M.S., Lehigh, 1947.
- HARRY THOMAS HAHN (1947, 1950)..... *Assistant Professor of Education; Counsellor, University Counseling Center*
B.S., Pennsylvania State Teachers College (Kutztown), 1940; M.Ed., Temple, 1942.
- JOHN MCVICKAR HAIGHT (1949)..... *Instructor in History*
A.B., Princeton, 1940; M.A., Yale, 1947.
- THEODORE HAILPERIN (1946)..... *Assistant Professor of Mathematics*
B.S., Michigan, 1939; Ph.D., Cornell, 1943.
- ROBERT WILLIAM HALL (1902, 1942)..... *Professor Emeritus of Biology*
Ph.B., Yale, 1895; A.B., Harvard, 1897; M.A., 1898; Ph.D., 1901.
- JOSEPH PETER HALL, JR. (1950)..... *Research Assistant in Chemistry*
A.B., Middlebury, 1948; M.S., 1950.
- HOWARD HALPIN (1948)..... *Research Assistant in Chemistry*
B.A., Cornell, 1948.
- MERLE HAMILTON (1950)..... *Assistant in Air Science and Tactics*
Master Sergeant, USAF.
- JOHN H. HARKINS (1950)..... *Associate Professor of Military Science and Tactics*
B.S., USMA, 1924; Major, U.S.A.
- SAMUEL THOMAS HARLEMAN (1946)..... *Executive Secretary of the Council of Lehigh Class Agents*
M.E., Lehigh, 1901.

FACULTY AND STAFF

- GEORGE DEWEY HARMON (1925, 1942).....*Professor of American History, Head of the Department of History and Government*
B.A., Duke, 1921; M.A., 1922; Ph.D., Pennsylvania, 1930.
- THOMAS GARDE HARRIS (1941).....*Research Associate in Chemistry*
B.S. in Ch.E., Lehigh, 1937; M.S., 1939; Ph.D., 1941.
- JOHN DAVID HARTIGAN (1900).....*Superintendent of Power Plant*
- ELIZABETH REGINA HARTMAN (1943, 1949).....*Head of the Library Circulation Department*
B.A., Moravian College for Women, 1931; B.S. in L.S., Drexel Institute of Technology, 1940.
- JAMES BUSSE HARTMAN (1945, 1948).....*Associate Professor of Mechanical Engineering*
B.S. in M.E., Lehigh, 1931; M.S., 1932; Ph.D., 1947.
- ALBERT EDWARD HARTUNG (1947, 1948).....*Instructor in English,*
B.A., Lehigh, 1947.
- PETER HAVAS (1946, 1949).....*Associate Professor of Physics*
Dipl., Technische Hochschule, Vienna, 1938; Ph.D., Columbia, 1944.
- †BYRON CROMWELL HAYES (1941).....*Director of Admissions*
B.E., Illinois State Teachers College, 1935; M.A., Chicago, 1938.
- WILLIAM GEORGE HAYWARD (1944).....*Instructor in Education*
B.S., Rutgers, 1930; A.M., Columbia, 1932; Ed.D., 1940.
- FRANK HENRY HEALEY (1949).....*Instructor in Chemistry*
A.B., Clark, 1947; Ph.D., 1949.
- STANLEY FREDERICK HEFFNER (1930, 1946).....*Manager of the Supply Bureau*
- *EDWARD ANTHONY HEISLER (1949).....*Graduate Assistant in Psychology*
B.A., Lehigh, 1949.
- ROBERT FORD HERRICK (1936, 1946).....*Director of Public Relations*
B.A., Lehigh, 1934.
- CHARLES HOLMES HERTY III (1949).....*Graduate Assistant in Chemistry and Chemical Engineering*
B.S., University of North Carolina, 1948.
- JOHN ATLEE HERTZ (1945).....*Instructor in English*
A.B., Moravian, 1938; M.A., Lehigh, 1947.
- HENRY JOHN HETTEL (1950).....*Research Assistant in Chemistry*
B.S., Villanova, 1950.
- JON JAMES HOPKINS (1948).....*Instructor in Speech*
B.E., Northern Illinois State Teachers College, 1941.
- HERVEY DEVOLZO HOTCHKISS (1946).....*Associate Professor of Finance*
B.S. in Bus. Adm., Buffalo, 1934; M.A., Cornell, 1936.
- GEORGE HOWATT (1948).....*Instructor in Government*
Ph.B., Muhlenberg, 1940; M.A., Lehigh, 1949.
- EDWARD ASHER HOWER (1938).....*Manager of Realty, Brodhead Estate.*

†On leave December 1, 1950.

*Resigned January 31, 1951.

LEHIGH UNIVERSITY

- *GARTH AHYMAN HOWLAND (1927, 1946) *Professor of Fine Arts*
Head of the Department of Fine Arts
 B.A., North Dakota, 1912; M.A., Harvard, 1930.
- PERCY HUGHES (1907, 1942) *Professor Emeritus of Philosophy*
 A.B., Alfred, 1899; A.M., Columbia, 1902; Ph.D., 1904.
- WALTON HERBERT HUTCHINS (1950) *Instructor in Journalism*
 A.B., Syracuse, 1938.
- JAMES MEAD HYATT (1946) *Associate Professor of Physics*
 A.B., Cornell, 1918; Ph.D., 1922.
- MERLE MAURICE IRVINE (1950) *Graduate Assistant in Physics*
 B.S., Montana State, 1950.
- JACOB ROBERT ISKEN (1951) *Instructor in Industrial Engineering*
 B.A., Stanford, 1947.
- THOMAS EDGAR JACKSON (1937, 1946) *Associate Professor of*
Mechanical Engineering
 B.S. in M.E., Carnegie Institute of Technology, 1934; M.S., Lehigh, 1937.
- JOHN EDWARD JACOBI (1948) *Associate Professor of Sociology*
 B.A., Lehigh, 1929; Ph.D., New York University, 1933.
- JACOB THORSTEN JACOBSEN (1948) *Instructor in Civil Engineering*
 B.S. in C.E., Lehigh, 1948.
- CHARLES ROBERT JACOBSON (1950) *Research Assistant in Chemistry*
 Sc.B., Brown, 1950.
- GEORGE ROBERT JENKINS (1948) *Assistant Professor of Geology*
 B.A., Colorado, 1936; Ph.M., Wisconsin, 1938.
- WILLIAM LEROY JENKINS (1934, 1947) *Professor of Psychology*
 B.S. in Chem., Brooklyn Polytechnic Institute, 1921; M.A., Michigan, 1932;
 Ph.D., 1936.
- CYRIL DEWEY JENSEN (1925, 1945) *Professor of Civil Engineering*
 B.S. in C.E., Minnesota, 1921; M.S., Lehigh, 1929; C.E., Minnesota, 1930.
- FINN BJORN JENSEN (1947) *Associate Professor of Economics*
 A.B., Southern California, 1934; M.A., 1935; Ph.D., 1940.
- ARTHUR PHILIP JENTOFT (1950) *Graduate Assistant in Civil*
Engineering
 B.S. in C.E., University of Washington, 1950.
- †BRUCE GILBERT JOHNSTON (1938, 1945) *Professor of Civil*
Engineering, Director of the Fritz Engineering Laboratory
 B.S. in C.E., Illinois, 1930; M.S., Lehigh, 1934; Ph.D., Columbia, 1938.
- ELWOOD RUSSELL JOHNSTON, JR. (1949) *Assistant Professor of*
Civil Engineering
 B.C.E., University of Delaware, 1946; S.M., Massachusetts Institute of Tech-
 nology, 1947; Sc.D., 1949.
- LEMUEL ROY JOHNSTON (1945) *Instructor in Education*
 A.B., North Carolina, 1914; M.A., Columbia, 1925; Ph.D., New York Uni-
 versity, 1926.

*Died April 20, 1950.

†Resigned August 31, 1950.

FACULTY AND STAFF

- WILLIAM PUCETTE JOLLIE (1950).....*Graduate Assistant in Biology*
B.A., Lehigh, 1950.
- *PAUL HARRY KAAR (1946).....*Engineer of Tests, the Fritz*
B.S. in C.E., Illinois, 1938; M.S., Lehigh, 1948. *Engineering Laboratory*
- EDMUND LEONARD KAMINSKY (1951).....*Graduate Assistant in*
B.S. in C.E., Lehigh, 1949. *Civil Engineering*
- GEORGE EUGENE KANE (1950).....*Instructor in Industrial Engineering*
B.S., Pennsylvania State College, 1948.
- JOHN J. KARAKASH (1946).....*Assistant Professor of Electrical*
B.S. in E.E., Duke, 1937; M.S. in E.E., Pennsylvania, 1938. *Engineering*
- CARL OTTO KECK (1939, 1944).....*Director of the Students'*
M.D., Hahnemann Medical College, 1937. *Health Service*
- DOUGLAS JEROME KELLY (1950).....*Research Assistant in Chemistry*
B.S., University of Scranton, 1950.
- JOHN DALE KELLY (1947).....*Assistant Professor of Mechanical*
B.S. in Eng. Phys., Lehigh, 1929; M.A., Columbia, 1939. *Engineering*
- BENJAMIN COLLINS KENNY (1947, 1949).....*Instructor in Mathematics*
B.S., Bethany, 1947.
- CARL EDWARD KERN (1950).....*Instructor in English*
A.B., Albright, 1948; A.M., Cornell, 1949.
- ANDRE BEAUMONT KERR (1950).....*Research Assistant in Chemistry*
B.S., Lehigh, 1950.
- ROBERT LEWIS KETTER (1950).....*Research Assistant in Civil*
B.S., University of Missouri, 1950. *Engineering*
- JOHN IRVINE KIRKPATRICK (1938, 1943).....*Treasurer*
B.S. in Bus. Adm., Lehigh, 1929; M.B.A., New York University, 1949.
- ARTHUR WARNER KLEIN (1904, 1915).....*Professor of*
M.E., Lehigh, 1899. *Mechanical Engineering*
- ROBERT BAUMGARTNER KLEINSCHMIDT (1947).....*Assistant Professor*
B.S., Pennsylvania, 1931; M.S., 1932; M.A., 1941. *of Mechanics*
- ALFRED PAUL KOCH (1946).....*Assistant Professor of Accounting*
B.S. in Ed., Pennsylvania State Teachers College (Bloomsburg), 1939; M.S., Bucknell, 1940.
- ROGER EDWARD KOLM (1947).....*Assistant Professor of Civil*
B.S., Washington, 1940; M.S., Lehigh, 1942. *Engineering*
- RICHARD HOWARD KRAEMER (1950).....*Associate Professor of Air*
Major, USAF. *Science and Tactics*
- THOMAS CHARLES KUBELIUS (1948, 1949).....*Assistant Professor of*
B.S., University of Illinois, 1945; LL.B., 1947. *Business Law*
- GEORGE WALLACE KYTE (1946, 1947).....*Assistant Professor of History*
A.B., California, 1940; M.A., 1941; Ph.D., 1943.
- KENNETH WORCESTER LAMSON (1926, 1930).....*Associate Professor of*
A.B., Harvard, 1906; Ph.D., Chicago, 1917. *Mathematics*

*Resigned August 31, 1950.

LEHIGH UNIVERSITY

- ROBERT ANDREW CHISHOLM LANE (1950)..... *Graduate Assistant in
A.B., Indiana University, 1950. Mathematics and Astronomy*
- ALFRED BAER LAPONSKY (1946, 1947)..... *Instructor in Physics*
B.S. in Eng. Phys., Lehigh, 1943; M.S., 1947.
- FRED VIAL LARKIN (1912, 1948)..... *Professor Emeritus of
Mechanical Engineering*
B.S., Wisconsin, 1906; M.E., 1915; Eng.D., Stevens Institute of Technology,
1948.
- VORIS V. LATSHAW (1931, 1947)..... *Associate Professor of Mathematics*
B.A., Indiana, 1927; A.M., 1928; Ph.D., 1930.
- FRANCIS HAROLD LAXAR (1949)..... *Instructor in Metallurgy*
B.S., Columbia, 1943.
- MARION CANDLER LAZENBY (1946)..... *Assistant Professor of German*
B.A., Birmingham-Southern, 1930; M.A., Vanderbilt, 1933; Ph.D., Johns
Hopkins, 1941.
- FREDERIC GILMAN LAYMAN (1950)..... *Graduate Assistant in Geology*
B.A., Lafayette, 1950.
- WILLIAM BADER LECKONBY (1946)..... *Assistant Professor of Physical
Education, Coach of Varsity Football and Golf*
B.S., St. Lawrence, 1939.
- GERALD GRANT LEEMAN (1950)..... *Assistant Wrestling Coach*
B.A., Iowa State Teachers College, 1948.
- CARL ARTHUR LEIN (1950)..... *Graduate Assistant in Geology*
B.S., University of New Hampshire, 1950.
- JOHN DOUGLAS LEITH (1945, 1947)..... *Associate Dean of Students*
A.B., North Dakota, 1920; A.M., Columbia, 1924.
- ROSS HENRY LESSENTINE (1950)..... *Graduate Assistant in Geology*
B.A., College of Wooster, 1950.
- CHARLES MARTIN LEVETT, JR. (1950)..... *Graduate Assistant in Psychology*
B.A., Upsala, 1949.
- JOSEPH FRANCIS LIBSCH (1946, 1950)..... *Associate Professor of
Metallurgical Engineering*
B.S., M.S., Massachusetts Institute of Technology, 1940; D.Sc., 1941.
- JOHN ORTH LIEBIG, JR. (1946, 1949)..... *Assistant Professor of
Civil Engineering*
B.S. in C.E., Lehigh, 1940; M.S., 1949.
- ANDREW WILLARD LITZENBERGER (1929, 1933)..... *Superintendent of
Buildings and Grounds*
Cert. in Architectural Engineering, University of Pennsylvania, 1911.
- ALVIN CONRAD LOEWER, JR. (1948)..... *Assistant Professor of Civil
Engineering*
B.E., Johns Hopkins, 1942; Eng.D., 1948.
- THERON KENNETH LUTZ (1950)..... *Assistant in Air Science and Tactics*
Master Sergeant, USAF.
- HOWARD THEODORE MACFARLAND (1950)..... *Instructor in Electrical
Engineering*
B.S. and M.S. in Electrical Engineering, Massachusetts Institute of Technology,
1950.

FACULTY AND STAFF

- DARREL EUGENE MACK (1941, 1950).....*Professor of Chemical Engineering, Director of the Curriculum in Chemical Engineering*
B.S. in Ch.E., Purdue, 1934; M.S., Niagara, 1939; Ph.D., Purdue, 1941.
- JAMES DECKER MACK (1947).....*Librarian*
B.A., Lehigh, 1938.
- JOHN EDWARD MACK (1948).....*Graduate Assistant in Physics*
B.S., Montana State, 1948; M.A., 1949.
- EDWIN SEBASTIAN MALESKY (1949).....*Adviser on Veterans Affairs and Selective Service*
B.S., Muhlenberg, 1935; M.Ed., Temple, 1941.
- JOSEPH ABELE MAURER (1947, 1949).....*Assistant Professor of Classical Languages*
B.A., Moravian, 1932; M.A., Lehigh, 1936; Ph.D., Pennsylvania, 1948.
- LOUIS MAUS, JR. (1948).....*Graduate Assistant in Chemistry and Chemical Engineering*
B.S. in Ch.E., Lehigh, 1947; M.S., 1948.
- JOHN WALTER MAXWELL, JR. (1927, 1946).....*Bursar and Purchasing Agent*
B.S., Lehigh, 1926.
- KENNETH PETER MCCARTY (1949).....*Research Assistant in Chemistry*
B.S., Lehigh, 1949.
- JOSEPH BERNARD MCFADDEN (1948, 1950).....*Assistant Professor of Journalism*
B.A., St. Joseph's (New Brunswick), 1941; M.A., Syracuse, 1948.
- JAMES WILLARD MCGEADY (1950).....*Assistant to the Director of Admissions*
B.A., Lehigh, 1950.
- JOHN HOLTON MCGINN (1948).....*Graduate Assistant in Physics*
B.A., Pennsylvania, 1943; M.S., 1948.
- FRANK C. J. MCGURK (1949).....*Instructor in Psychology*
B.S. in Econ., University of Pennsylvania, 1933; M.A. in Psychology, 1937.
- JAMES ALAN MCLENNAN, JR. (1948).....*Graduate Assistant in Physics*
S.B., Harvard, 1948.
- RANDOLPH BOND MCMULLEN (1950).....*Graduate Assistant in International Relations*
B.S., Lehigh, 1950.
- MURRAY BURNS MCPHERSON (1947).....*Assistant Professor of Civil Engineering*
B.S., Bucknell, 1942; M.S., State University of Iowa, 1947.
- CLARENCE ROBERT MEHL (1950).....*Graduate Assistant in Physics*
B.S., Montana State, 1949.
- MALCOLM THOMAS MELESTER (1950).....*Research Assistant in Chemistry*
B.S., Franklin and Marshall, 1950.
- FRANCIS LEWIS MEINHOFER (1949).....*Research Assistant in Chemistry*
B.S., Lehigh, 1949.
- STANLEY MICK (1951).....*Assistant in Air Science and Tactics*
Master Sergeant, USAF.
- ARCHIE ROSCOE MILLER (1922, 1946).....*Professor of Electrical Engineering*
B.S. in E.E., Illinois, 1918; M.S., Lehigh, 1925.
- BLAINE MONROE MILLER, JR. (1951).....*Graduate Assistant in Mechanical Engineering*
B.S., West Virginia University, 1951.

- PERCIVAL FORD MILLER (1947) *Assistant Professor of Mechanics*
E.E., Rensselaer Polytechnic Institute, 1928; M.S., New York State College for Teachers (Albany), 1940; M.S., Cornell, 1948.
- VIRGIL R. MILLER (1949) *Professor of Military Science and Tactics, Head of the Department of Military Science and Tactics*
B.S., U.S. Military Academy, 1924; Colonel, U.S.A.
- SAMUEL HAROLD MISSIMER (1950) *Assistant to the Director of Admissions*
B.A., Lehigh, 1950.
- DOUGLAS EWART MODE (1940, 1946) *Associate Professor of Electrical Engineering*
B.S. in E.E., Pennsylvania, 1935; M.S. in E.E., 1940; Ph.D., 1947.
- JOHN HARVEY MOODY (1947) *Assistant in Military Science and Tactics*
Master Sergeant, U.S.A.
- CARL LELAND MOORE (1948) *Instructor in Accounting*
A.B., Bucknell, 1943; M.A., Pittsburgh, 1948.
- CHARLES JOHN MORAVEC (1937, 1946) *University News Editor*
B.S., Albright, 1937.
- ROBERT PATTISON MORE (1916, 1950) *Professor of German, Head of the Department of German, Dean of the College of Arts and Science, Director of the Curriculum in Arts and Science*
B.A., Lehigh, 1910; M.A., Harvard, 1913.
- E. ROBINS MORGAN (1935, 1949) *Placement Advisor*
M.E., Lehigh, 1903.
- EDGAR KIRTON MUHLHAUSEN (1946, 1949) *Assistant Professor of Civil Engineering*
B.S. in C.E., Lehigh, 1942; M.S., 1948.
- DONALD C. MULLIN (1950) *Instructor in Speech*
B.A., M.A., State University of Iowa
- RAFFAELE FRANCESCO MURACA (1948, 1950) *Instructor in Chemistry*
B.S. in Chem., Lehigh, 1944; M.S., 1947.
- JOHN FRANCIS MURPHY (1947) *Assistant in Military Science and Tactics*
Staff Sergeant, U.S.A.
- FRANK EVANS MYERS (1946) *Professor of Physics, Head of the Department of Physics, Director of the Curriculum in Engineering Physics*
B.A., Reed, 1927; M.S., New York University, 1930; Ph.D., 1934.
- RAYMOND REEVER MYERS (1950) *Research Assistant in Chemistry*
B.A., Lehigh, 1941; M.S., University of Tennessee, 1942.
- BENJAMIN MATTHIAS NEAD (1947, 1949) *Instructor in English*
B.A., Lehigh, 1947.
- RONALD ELLIOTT NECE (1949, 1950) *Instructor in Civil Engineering*
B.S. in C.E., University of Washington, 1949.
- ALVA LLOYD NEDLEY (1950) *Graduate Assistant in Mechanical Engineering*
A.B., Washington and Jefferson, 1947; B.S., Carnegie Institute of Technology.
- HENRY CLINTON NEEDLES (1950) *Graduate Assistant in International Relations*
B.A., Lehigh, 1950.

FACULTY AND STAFF

- JOSEPH SHIVE NEIDIG (1949).....*Visiting Instructor in Education*
Ph.B., Muhlenberg, 1924; M.A., Pennsylvania, 1928.
- HARVEY ALEXANDER NEVILLE (1927, 1938).....*Professor of Chemistry and Chemical Engineering, Head of the Department of Chemistry and Chemical Engineering, Director of the Lehigh Institute of Research, Dean of the Graduate School*
A.B., Randolph-Macon, 1918; M.A., Princeton, 1920; Ph.D., 1921.
- WILLIAM ARTHUR NEVILLE (1949).....*Graduate Assistant in English*
A.B., University of New Hampshire, 1949.
- RALPH ANDERSON NEWMAN (1950).....*Associate Professor of Air Science and Tactics, Head of the Department of Air Science and Tactics*
B.S., V.P.I., 1941; Major, USAF.
- JOHN PATRICK NOONAN (1950).....*Instructor in English*
B.A., Rutgers, 1948; M.A., University of Wisconsin, 1949.
- ROBERT B. NORRIS (1950).....*Assistant Professor of Education*
B.S. in Ed., Mansfield State Teachers College, 1939; M.Ed., Harvard, 1946.
- JOHN HUTCHESON OGBURN (1895, 1939).....*Professor Emeritus of Mathematics and Astronomy*
C.E., Vanderbilt, 1892.
- JAMES BERNARD O'HARA (1950).....*Assistant Professor of Chemical Engineering*
B.S. in Ch.E., Illinois, 1944; M.S. in Ch.E., Michigan, 1946; Ph.D., Case, 1949.
- MERRITT WAYNE OLSON (1949).....*Research Assistant in Psychology*
B.S., Lawrence, 1949.
- JOHN PHILIP ONDRECHEN (1949).....*Instructor in Economic Statistics*
A.B., Western Reserve, 1948; A.M., University of Pennsylvania, 1949.
- JOHN ONILA (1948).....*Associate Professor of Air Science and Tactics*
Major, U.S.A.
- BRADFORD BRECKENRIDGE OWEN (1945, 1948).....*Associate Professor of Biology*
B.A., Williams, 1934; M.A., 1936; Ph.D., Harvard, 1940.
- RUTH ELMINA COSGROVE PACE (1948, 1949).....*First Assistant Circulation Librarian*
B.A., Moravian College for Women, 1941; B.S. in L. S., Carnegie Library School, 1942.
- ANTHONY PACKER (1946).....*Assistant Professor of Physical Education, Coach of Varsity Basketball*
B.S., St. Lawrence, 1938.
- FRANK VINCENT PALEVICZ (1946, 1950).....*Assistant Professor of Education, Assistant to the Director of Placement*
B.S. in Ed., New Jersey State Teachers College, 1938; M.Ed., Rutgers 1946.
- PHILIP MASON PALMER (1902, 1950).....*Dean Emeritus of the College of Arts and Science*
A.B., Bowdoin, 1900; A.B., Harvard, 1902; Dr.h.c., Padua, 1922; Litt.D., Moravian, 1941.
- BASIL WALDO PARKER (1940, 1946).....*Associate Professor of Biology*
S.B., Massachusetts Institute of Technology, 1933; A.M., Harvard, 1935; Ph.D., Massachusetts Institute of Technology, 1939.
- ROBERT H. PARKS (1950).....*Instructor in Economics*
A.B., Swarthmore College, 1949; M.A., University of Pennsylvania, 1950.

LEHIGH UNIVERSITY

- PRESTON PARR, JR. (1911)..... *Assistant to the Director, Institute of Research*
B.S. in Ch.E., Lehigh, 1943; M.S., 1944.
- GEORGE L. PARTLOW (1950)..... *Assistant in Military Science and Tactics*
B.S., Wofford, 1937; Master Sergeant, U.S.A.
- HARRY GORDON PAYROW (1916, 1950)..... *Associate Professor*
B.S. in C.E., Tufts, 1907. *Emeritus of Sanitary Engineering*
- GEORGE TERHUNE PECK (1946)..... *Assistant Professor of History*
B.A., Yale, 1937; M.A., Chicago, 1940; Ph.D., 1942.
- VINCENT ALOYSIUS PERRY (1949)..... *Instructor in Finance*
A.B., New York University, 1948; A.M., 1949.
- ALBERT GORDON PETERKIN III (1948)..... *Assistant Professor of*
B.A., Pennsylvania, 1936; M.A., Harvard, 1938. *Education*
- *JACKSON ROBERT EDWARD PHILIPS (1950)..... *Instructor in Finance*
B.A., University of Texas, 1942; M.A., 1950.
- ARTHUR EVERETT PITCHER (1938, 1948)..... *Professor of Mathematics*
A.B., Western Reserve, 1932; A.M., Harvard, 1933; Ph.D., 1935.
- FRANCIS JOSEPH QUIRK (1950)..... *Associate Professor of*
Fine Arts and Head of the Department of Fine Arts
Dipl. Rhode Island School of Design, 1929.
- VIRGINIA HESS RAIDLINE (1933, 1943)..... *Assistant Recorder, Chief Clerk*
- *EINAR MELVIN RAMBERG (1948)..... *Instructor in Industrial Engineering*
B.S. in M.E., Lehigh, 1946; M.S., 1947.
- GEORGE EMIL RAYNOR (1931, 1946)..... *Professor of Mathematics,*
Head of the Department of Mathematics and Astronomy
B.S., Washington, 1918; M.A., Princeton, 1920; Ph.D., 1923.
- GEORGIA RAYNOR (1945)..... *Circulation Assistant*
B.A., Pennsylvania State College for Women, 1945.
- ROBERT REED (1949)..... *Assistant in Military Science and Tactics*
Sergeant, U.S.A.
- JOSEPH H. RENO (1947, 1949)..... *Assistant Professor of*
M.D., Temple University, 1941. *Physical Education, Team Physician*
- SHIRLEY REESE (1949)..... *Graduate Assistant in Psychology*
B.A., Connecticut, 1948.
- HOWARD ROLAND REITER (1911, 1941)..... *Professor Emeritus of*
A.B., Princeton, 1898; M.A., 1900. *Physical Education*
- JOSEPH BENSON REYNOLDS (1907, 1948)..... *Professor Emeritus of*
Mathematics and Theoretical Mechanics
B.A., Lehigh, 1907; M.A., 1910; Ph.D., Moravian, 1919.
- RICHARD NOBLE RHODA (1940, 1949)..... *Assistant Professor of*
B.S. in Chem., Pittsburgh, 1939; M.S., Lehigh, 1940; Ph.D., 1944. *Chemistry*
- ALBERT AUGUSTUS RIGHTS (1933, 1943)..... *Assistant Professor of English*
A.B., Maine, 1927; A.M., Harvard, 1931.
- EDGAR HEISLER RILEY (1926, 1931)..... *Associate Professor of English*
A.B., Cornell, 1915; Ph.D., 1925.

*Resigned January 31, 1951.

FACULTY AND STAFF

- ROBERT FRANCIS RILEY (1919, 1947).....*Assistant Order Librarian*
- HOPE THOMAS MARTIN RITTER, JR. (1946, 1948)....*Instructor in Biology*
A.B., Cornell, 1943; M.S., Lehigh, 1947.
- DARNELL HIGGINS ROATEN (1950).....*Instructor in Romance Languages*
B.A., Central State College (Oklahoma), 1939.
- ROY WALTER ROMBERGER (1950)....*Graduate Assistant in Reading Clinic*
B.S., Pennsylvania State, 1949.
- VERNON METCALF ROOT (1950).....*Instructor in Philosophy*
B.S., Haverford, 1944; Ph.D., Yale, 1950.
- EDWARD PAUL ROWADY (1950).....*Instructor in Metallurgy*
B.S., University of Kentucky, 1950.
- LAWRENCE LEYENBERGER ROWE (1950)....*Graduate Assistant in Chemistry*
B.S., St. Joseph's, 1950.
- ROBERT WILLIAM JOHN RUBRIGHT (1950).....*Graduate Assistant in Chemistry*
A.B., Wilkes, 1950.
- JAN MARCEL RUZEK (1950).....*Research Assistant in Civil Engineering*
Dipl. Ing., Technical University of Prague, 1939; Weld. Ing., Technical University of Vienna, 1943; C.E., Min. of Interior, 1943.
- HELEN GENEVIEVE RYAN (1917).....*Secretary to the President*
- PERCY LEE SADLER (1946).....*Professor of Physical Education, Director of the Division of Athletics and Physical Education*
Col., Inf., U.S.A., Ret.
- JACOB SAMOLOFF (1949).....*Instructor in Mathematics*
B.A., University of Toronto, 1943.
- WILLIAM PAUL SAMUELS, JR. (1950).....*Research Assistant in Chemistry*
B.S., Lehigh, 1950.
- STEPHEN SAWRUCK (1950).....*Research Assistant in Chemistry*
B.S., Lehigh, 1950.
- RAYMOND BURKERT SAWYER (1946).....*Associate Professor of Physics*
Ph.B., Ripon, 1921; M.S., Wisconsin, 1925; Ph.D., Chicago, 1930.
- SAMUEL SCHECTER (1950).....*Instructor in Mathematics*
A.B., Brooklyn College, 1944.
- WILLIAM HEATON SCHEMPF (1947, 1950).....*Associate Professor of Music*
Mus.B., Wisconsin, 1939; Mus.M., Rochester, 1942.
- LEONARD HUBERT SCHICK (1941, 1946).....*Executive Secretary of the Lehigh Alumni Association, Editor of the Alumni Bulletin*
B.A., Lehigh, 1937.
- DONALD WALTER SCHMOYER (1946, 1949).....*Accountant*
B.S. in Bus. Adm., Lehigh, 1944.
- JOHN WHITING SCHREINER, JR. (1947, 1950).....*Associate Professor in Military Science and Tactics*
Major, U.S.A.
- DAVID CRAWFORD SCHUBERT (1949).....*Graduate Assistant in Physics*
B.S., Lehigh, 1949.

LEHIGH UNIVERSITY

- RUDOLPH GEORGE SCHUBERT (1950) *Graduate Assistant in Psychology*
B.A., Lehigh, 1951.
- HANS KARL SCHUCHARD (1946) *Assistant Professor of German*
B.S., Pennsylvania, 1931; A.M., 1932; Ph.D., 1938.
- ERNST BERNHARD SCHULZ (1927, 1946) *Professor of Political Science*
B.S., Michigan, 1920; M.A., 1921; Ph.D., 1927.
- THERON ALBERT SCHWEGLER (1950) *Graduate Assistant in Mathematics and Astronomy*
B.S., Baldwin-Wallace, 1950.
- HENRY ALBERT SEEBALD (1946) *Instructor in Mathematics*
B.A., Lehigh, 1942.
- CHARLES AUGUSTUS SEIDLE (1948) *Associate Dean of Students*
B.A., Pittsburgh, 1931; M.A., Columbia, 1936; Ed.D., 1948.
- EDITH AMANDA SEIFERT (1923, 1947) *Cashier*
- EARL JAMES SERFASS (1936, 1950) *Professor of Chemistry, Director of the Curriculum in Chemistry*
B.S. in Ch.E., Lehigh, 1933; M.S., 1935; Ph.D., 1938.
- JONATHAN BURKE SEVERS (1927, 1941) *Professor of English*
A.B., Rutgers, 1925; A.M., Princeton, 1927; Ph.D., Yale, 1935.
- WILLIAM SHERIDAN (1911, 1946) *Assistant Professor of Physical Education; Coach of Wrestling and Soccer*
- ARTHUR MASON SHERMAN, JR. (1948) *Assistant Professor of Religion*
B.A., Trinity, 1938; B.D., Virginia Theological Seminary, 1942.
- DAVID ALAN SHERMER (1949) *Research Assistant in Chemistry*
B.S. in Ch.E., Lehigh, 1949.
- CLARENCE ALBERT SHOOK (1930, 1946) *Professor of Mathematics*
A.B., Western Reserve, 1916; A.M., Harvard, 1918; Ph.D., Johns Hopkins, 1928.
- PAUL EDWARD SHORT (1938, 1946) *Assistant Professor of Physical Education; Assistant Director and Business Manager of Athletics*
B.S. in Bus. Adm., Lehigh, 1934.
- JOHN DAVID SHOUP (1949) *Research Assistant in Chemistry*
B.S., Purdue, 1949.
- JAMES DOWNS SHREVE, JR. (1947) *Instructor in Physics*
B.S., Franklin and Marshall, 1947.
- REYNOLD ALLEN SHUNK (1949) *Graduate Assistant in Physics*
B.S. in Eng. Physics, Montana State College, 1949.
- CHARLES WELLINGTON SIMMONS (1928, 1940) *Professor of Chemical Engineering*
B.Sc., Queens (Ontario), 1920; M.S., Lehigh, 1928.
- JOHN AROL SIMPSON (1950) *Research Assistant in Chemistry*
B.S., Lehigh, 1946; M.S., Lehigh, 1948.
- LLOYD LEROY SMAIL (1926, 1929) *Professor of Mathematics*
A.B., University of Washington, 1911; A.M., 1912; Ph.D., Columbia, 1913.
- EARL KENNETH SMILEY (1934, 1945) *Vice-President*
A.B., Bowdoin, 1921; M.A., Lehigh, 1935; L.H.D., Moravian, 1947.

FACULTY AND STAFF

- ALEXIS SMISLOVA (1949)..... *Graduate Assistant in Civil Engineering*
B.S. in C.E., Robert College, (Istanbul), 1943.
- ROBERT METCALF SMITH (1925)..... *Professor of English,*
Head of the Department of English
A.B., Amherst, 1908; A.M., Columbia, 1909; Ph.D., 1915.
- WESLEY RICHARD SMITH (1950)..... *Graduate Assistant in Physics*
B.S., Lehigh, 1950.
- JUDSON GRAY SMULL (1919, 1950)..... *Associate Professor Emeritus of*
B.S. in Chem., Lehigh, 1906; M.S., 1921. *Chemistry*
- CHARLES FREDERICK SMULLIN (1948)..... *Research Associate in Chemistry*
B.S. in Ch.E., Lehigh, 1938; M.S., 1940.
- *RICHARD JOSEPH SMURTHWAITE (1950)..... *Graduate Assistant in*
B.S., University of Buffalo, 1950. *Mathematics and Astronomy*
- MAX DONALD SNIDER (1946)..... *Assistant Professor of Economics*
B.S., Illinois, 1936; M.S., 1937; M.B.A., Stanford, 1941.
- HUBERT HOWARD SNYDER (1949)..... *Instructor in Mathematics*
B.A., Marietta, 1949.
- RAYMOND HORNING SNYDER (1950)..... *Assistant Professor of*
B.S. in C.E., Lehigh, 1938. *Sanitary Engineering*
- RAFAEL ARCHANGEL SOTO (1925, 1943)..... *Associate Professor of*
B.S., Illinois, 1912; B.A., 1915; M.A., 1917. *Romance Languages*
- JAMES W. SOVERNS (1947, 1950)..... *Associate Professor of Military*
Science and Tactics
B.S., California State Teachers College, 1934; Major, U.S.A.
- WILBUR DEVILLA BERNHART SPATZ (1946)..... *Assistant Professor of*
Physics
B.S., Lafayette, 1930; M.S., Purdue, 1934; Ph.D., New York University, 1943.
- ROBERT HARRY SPOHN (1946, 1947)..... *Instructor in Mathematics*
A.B., Lebanon Valley, 1936; M.A., Lehigh, 1948.
- RALPH STEINHARDT (1948)..... *Research Assistant in Chemistry*
B.S. in Chem., Lehigh, 1940; M.S., 1941; B.S. in Chem.E., V.P.I., 1944;
Ph.D., Lehigh, 1950.
- ROBERT ROTH STOLL (1946, 1947)..... *Associate Professor of Mathematics*
B.S. in Phys. and Eng., Pittsburgh, 1936; M.S., 1937; Ph.D., Yale, 1942.
- RICHARD RHODE STORROW (1950)..... *Graduate Assistant in Chemistry*
B.A., Lehigh, 1950.
- BRADLEY STOUGHTON (1923, 1944)..... *Professor Emeritus of Metallurgy*
Ph.B., Yale, 1893; B.S., Massachusetts Institute of Technology, 1896; Eng.D.,
Lehigh, 1944.
- ROBERT DANIEL STOUT (1939, 1950)..... *Professor of Metallurgical*
B.S., Pennsylvania State, 1935; M.S., Lehigh, 1941; Ph.D., 1944. *Engineering*
- CARL FERDINAND STRAUCH (1938, 1946)..... *Associate Professor of English*
A.B., Muhlenberg, 1930; M.A., Lehigh, 1934; Ph.D., Yale, 1946.
- HOWARD SAMUEL STRAUSSER, JR. (1950)..... *Instructor in Civil Engineering*
B.S. in C.E., Virginia Military Institute, 1942; M.S., Johns Hopkins University,
1950.

*Resigned January 31, 1951.

- MILTON CALEB STUART (1926) *Professor of Mechanical Engineering, Head of the Department of Mechanical Engineering, Director of the Curriculum in Mechanical Engineering, Acting Head of the Department of Industrial Engineering, Acting Director of the Curriculum in Industrial Engineering*
B.S. in M.E., Pennsylvania, 1909; M.E., 1924.
- ROBERT LAMB STUBBINGS (1949) *Research Associate in Chemistry*
B.S. in Chem., Lehigh, 1941; M.S., 1946; Ph.D., 1949.
- HALE SUTHERLAND (1930).....*Professor of Civil Engineering*
A.B., Harvard, 1906; S.B., Massachusetts Institute of Technology, 1911.
- JOHN JOSEPH SURASH (1950) *Graduate Assistant in Chemistry*
B.S., Wilkes, 1950.
- *RONALD JAMES SWEENEY (1947) *Assistant Professor of Mechanical Engineering*
M.E., Cornell, 1928.
- JOHN MCFALL SYLVESTER (1946).....*Lecturer on Plant Management*
Graduate, U. S. Naval Academy, 1911.
- ROBERT SAYRE TAYLOR, JR. (1950) *Legal Counsel*
B.A., Lehigh, 1925; LL.B., University of Pennsylvania, 1928.
- JAMES HOWARD TAYLOR, JR. (1950).....*Graduate Assistant in Chemical Engineering*
B.S., Virginia Polytechnic Institute, 1950.
- ROBERT SAXTON TAYLOR (1950).....*Second Assistant Cataloguer*
A.B., Cornell, 1940.
- EVERETT ANDERSON TEAL (1945)..... *Assistant Professor of Education, Director of the University Counseling Center, Director of Placement*
B.S., Ball State Teachers College, 1932; M.A., Columbia, 1941.
- EDWIN RAYMOND THEIS (1927, 1938)..... *Research Professor of Industrial Biochemistry*
Ch.E., Cincinnati, 1921; Ph.D., 1926.
- HAROLD PRESCOTT THOMAS (1932)..... *Professor of Education, Head of the Department of Education, Director of the General College Division, Director of the Summer Session, Director of the Adult Education Program*
B.S., Colgate, 1920; Ed.M., Harvard, 1925; Ed.D., 1932.
- STANLEY JUDSON THOMAS (1923, 1928)..... *Professor of Bacteriology, Head of the Department of Biology*
B.S., Lafayette, 1912; M.S., Lehigh, 1913; M.A., 1915; Ph.D., Pennsylvania, 1928.
- LOUIS FELSINGER THOMPSON (1950).....*Graduate Assistant in English*
A.B., Columbia, 1948.
- THOMAS CLAYTON THORSTENSEN (1949).....*Research Associate in Chemistry*
B.S. in Chem., Minnesota, 1942; M.S., Lehigh, 1947; Ph.D., 1949.
- BRUNO THURLIMAN (1948).....*Research Assistant in Civil Engineering*
Dipl., Swiss Federal Institute of Technology, 1946.
- SADUN SERVET TÖR (1949, 1950)..... *Assistant Professor of Civil Engineering*
E.M., Colorado School of Mines, 1939; M.E.M., 1940; M.S., Lehigh, 1941; Ph.D., 1945.

*Resigned January 31, 1951.

FACULTY AND STAFF

- FRANCIS JOHN TREMBLEY (1928, 1949).....*Professor of Biology*
B.S., Hobart, 1928; M.S., Lehigh, 1931; Ph.D., Pennsylvania, 1940.
- JOHN SCHRADER TREMPER (1939).....*Assistant Professor of German*
A.B., Colgate, 1928; M.A., Cornell, 1932; Ph.D., 1938.
- ROCCO JOHN TRESOLINI (1949).....*Assistant Professor of Political*
A.B., Hartwick, 1942; M.A., Syracuse, 1947; Ph.D., 1949. *Science*
- VINCENT WILLIAM UHL (1947).....*Instructor in Chemical Engineering*
B.S. in Ch.E., Drexel Institute of Technology, 1940.
- WILLIAM VAN ALEN (1950).....*Graduate Assistant in Geology*
A.B., Brown, 1950.
- RALPH NEWCOMB VANARNAM (1928, 1942).....*Assistant Professor*
E.E., Cornell, 1926; M.S., 1927. *of Mathematics and Astronomy*
- FRANK JOSEPH VELESZ (1948).....*Instructor in Economics*
B.A., Western Michigan, 1948; M.A., University of Chicago, 1949.
- RICHARD JOSEPH VLAUN (1950).....*Assistant in Air Science and Tactics*
Master Sergeant, USAF.
- JAMES HAROLD WAGNER (1949).....*Acting Registrar*
B.A., Gettysburg, 1947; M.A., University of Pennsylvania, 1950.
- WILLIAM COMSTOCK WALKER (1946).....*Research Associate in Chemistry*
B.S. in Ch.E., Lehigh, 1943; M.S., 1944; Ph.D., 1946.
- RUSSELL V. WALL, JR. (1949).....*Assistant in Military Science and*
Master Sergeant, U.S.A. *Tactics*
- PAUL B. WALTER (1951).....*Assistant Professor of Military*
Science and Tactics
A.B., University of Tennessee, 1931; M.A., University of North Carolina, 1944;
Captain, U.S.A.
- SHERWOOD GEORGE WALTERS (1950).....*Instructor in Economics*
A.B., Western Maryland College, 1949.
- THOMAS W. WATKINS (1949).....*Visiting Instructor in Education*
A.B., Dickinson, 1931; M.A., Lehigh, 1942.
- JOHN WILLIAM WAY (1950).....*Graduate Assistant in Chemistry*
B.S., Lehigh, 1950.
- MARY WEIR (1950).....*Research Assistant in Chemistry*
B.S., Pennsylvania State, 1938.
- JOHN HILLS WEITZ (1947).....*Assistant Professor of Geology*
A.B., Wesleyan, 1938; M.S., Lehigh, 1940.
- AMBROSE RANDALL WEST (1948).....*Associate Professor of Civil*
B.S. in C.E., Pennsylvania State, 1926. *Engineering*
- DONALD BINGHAM WHEELER, JR. (1947).....*Assistant Professor*
of Physics
B.S. in Eng. Phys., Lehigh, 1938; Ph.D., California Institute of Technology, 1947.
- MARTIN DEWEY WHITAKER (1946).....*President*
A.B., Wake Forest, 1927; M.A., North Carolina, 1930; Ph.D., New York University, 1935; LL.D., Lafayette, 1946; Sc.D., Moravian, 1947; Sc.D., Wake Forest, 1947; LL.D., Rutgers, 1948.

- EDMUND WILLIAM WHITE (1950) ... *Graduate Assistant in Chemical Engineering*
A.B., Columbia, 1940.
- *WILLIAM BECKLER WHITE (1946, 1948) ... *Instructor in English*
A.B., Hampden-Sydney, 1940; M.A., Lehigh, 1942.
- WILLIAM GORDON WHITTON (1950) ... *Assistant Football Coach*
- ALBERT WILANSKY (1948) ... *Assistant Professor of Mathematics*
B.A., Dalhousie, 1941; B.S., 1942; Ph.D., Brown, 1947.
- RALPH MYRON WILCOX (1950) ... *Graduate Assistant in Physics*
B.S., Iowa State, 1950.
- BRADFORD WILLARD (1939) ... *Professor of Geology*
Head of the Department of Geology
B.A., Lehigh, 1921; A.M., Harvard, 1922; Ph.D., 1923.
- WILLIAM BEDFORD WILLIAMSON (1948, 1950) ... *Instructor in International Relations*
B.S. in Ed., Temple, 1940; S.T.B., 1942; S.T.M., Lutheran Theological Seminary at Philadelphia, 1945.
- DONALD A. WOLF (1949, 1950) ... *Instructor in English*
B.S., Lehigh, 1947; M.A., Lehigh, 1950.
- HILTON WYMAN WOODKE (1949) ... *Instructor in Accounting*
B.S.C., University of Iowa, 1948; M.A., 1949.
- HORACE WETHERILL WRIGHT (1921, 1950) ... *Professor Emeritus of Latin*
A.B., Wisconsin, 1908; Ph.D., Pennsylvania, 1917.
- HAROLD ELTON YINGST (1950) ... *Graduate Assistant in Physics*
B.S., Lebanon Valley, 1950.
- DALE ROBERT YOUNG (1951) ... *Instructor in Civil Engineering*
B.S. in C.E., University of Washington, 1948; M.S., 1950.
- GEORGE JAMISON YOUNG (1950) ... *Research Assistant in Chemistry*
B.S., Rensselaer Polytechnic Institute.
- JOHN HUGHES YOUNG (1950) ... *Research Assistant in Chemistry*
B.S., Lafayette, 1949.
- PETER ALBERT YURICK (1950) ... *Research Assistant in Chemistry*
B.S., Muhlenberg, 1950.
- ALBERT CHARLES ZETTLEMOYER (1941, 1950) ... *Professor of Chemistry*
B.S. in Ch.E., Lehigh, 1936; M.S., 1938; Ph.D., Massachusetts Institute of Technology, 1940.
- HOWARD J. B. ZIEGLER (1947, 1949) ... *Assistant Professor of Philosophy, Acting Chairman of the Department of Philosophy*
B.A., Franklin and Marshall, 1930; B.D., Theological Seminary of the Reformed Church in U. S., 1933; S.T.M., Lutheran Theological Seminary at Philadelphia, 1941; Ph.D., Columbia, 1950.
- MANFRED SIEGFRED ZITZMAN (1949) ... *Graduate Assistant in Chemistry*
B.S., Albright, 1949.

*On leave December 1, 1950.

FELLOWS AND SCHOLARS

- NARAYANA IYER ANANTHANARAYANAN.....*Honor Fellow in Metallurgy*
B.Sc., University of Madras, S. India, 1936; A.I.I.Sc., Indian Institute of Science,
1949.
- JOSEPH WINDER ATKINS.....*University Scholar in English*
B.A., Lehigh, 1949.
- KNUT BEHRENS*Honor Fellow in Metallurgy*
Dipl., Tech. Hochschule, Aachen, 1950.
- UPPINANGADY GOPALKRISHNA BHAT.....*University Scholar in*
B.S., Benares Hindu University, 1948. *Metallurgy*
- HARTWELL WALTER LEWIS BOWSFIELD *Parkhurst Fellow in History*
B.A., Manitoba, 1948.
- JOSEPH JOHN CARINO.....*Byllesby Fellow in Electrical Engineering*
B.S., Connecticut, 1950.
- RITA COTA.....*Thorne Fellow in Bacteriology*
B.A., Pennsylvania State College, 1948; M.S., Lehigh, 1949.
- FREDERIC RUDOLPH CROWNFIELD, JR.....*Hood Fellow in Physics*
A.B., Harvard, 1948; M.S., Lehigh, 1949.
- CHARLES THEODORE DICKERT.....*Sinclair Fellow in Chemistry*
B.S. in Ch.E., Lehigh, 1950.
- LUDMILA GEORGIEV JOLLIE.....*University Scholar in Biology*
Physikum, Heidelberg, 1949.
- HARRY NICHOLAS HANTZES.....*University Scholar in Bacteriology*
B.S., Albright, 1944; M.S., Lehigh, 1948.
- WILLIAM KNOTT HARLAN.....*University Scholar in Biology*
B.A., Lehigh, 1949.
- ALFONS WILHELM HUBER.....*Hoppes Fellow in Civil Engineering*
Cand. Ing., Tech. Hochschule Graz, 1949.
- CONRAD JOHN ISAK.....*Gotsball Scholar in Electrical Engineering*
B.Sc., Rutgers, 1950.
- JOHN HERBERT JOHNSEN.....*New Jersey Zinc Company Fellow in Geology*
A.B., Syracuse, 1947; M.Sc., 1948.
- JOSEPH ANTHONY KANEHANN.....*Socony-Vacuum Oil Company*
B.S. in Chem., Lehigh, 1950. *Fellow in Chemistry*
- FREDERICK CHARLES LANGENBERG.....*Gotsball Scholar in Metallurgy*
B.S., Lehigh, 1950.
- HOWARD MACKEY.....*University Scholar in History*
B.A., Toledo, 1950.
- RICHARD WALES MAYO*Brink Fellow in Civil Engineering*
B.S. in C.E., Newark College of Engineering, 1950.

LEHIGH UNIVERSITY

- RANDOLPH BOND McMULLEN *University Scholar in History*
B.A., Lehigh, 1950.
- KENNETH HARVEY MESSNER *Packard Fellow in Electrical Engineering*
B.E., Vanderbilt, 1950.
- LOUIS ANTON MOUCHA *Byllesby Fellow in Electrical Engineering*
B.S., Connecticut, 1950.
- CHARLES FREDERICK MUENCH *Gotsball Fellow in Metallurgy*
B.S., Lafayette, 1950.
- WILLIAM J. MURPHY *International Nickel Company Fellow in Metallurgy*
B.S., Wayne, 1950.
- RICHARD JASON ORFORD *Packard Fellow in Electrical Engineering*
B.S., Lehigh, 1950.
- WILLIAM JAMES SCHARLE *University Scholar in Chemical Engineering*
B.S. in Ch.E., Villanova, 1950.
- GROVER JACOB SCHRAYER, JR. *Student Chemistry Foundation Fellowship in Chemistry*
B.S. in Chem., Lehigh, 1950.
- RUDOLF FRIEDRICH STENGEL *Baldwin Fellow in Mechanical Engineering*
B.S., Munich Technical University, 1950.
- KENNETH GILBERT SWAYNE *DuPont Company Fellow in Mechanical Engineering*
B.S. in M.E., Lehigh, 1943; M.S., 1948.
- GEORGE WASHINGTON TAYLOR, JR. *Gotsball Scholar in Chemical Engineering*
B.S., Princeton, 1948.
- THEODORE ALFRED TERRY *Westinghouse Company Fellow in Mechanical Engineering*
B.S., Drexel Institute of Technology, 1950.
- HENRY PETER VOZNICK *Gotsball Scholar in Chemical Engineering*
B.Ch.E., Virginia, 1950.
- JOHN EDGAR WALSH *University Scholar in History*
B.S., Scranton, 1949.
- DONALD WARREN *DuPont Company Fellow in Metallurgy*
B.S., Kentucky, 1948; M.S., Lehigh, 1949.
- JOHN CALVIN WILLIAMS *Byllesby Fellow in Civil Engineering*
B.S., Virginia, 1945; B.S. in C.E., Lafayette, 1950.
- ROBERT LEON WIMBERLEY *University Scholar in English*
A.B., Wichita, 1950.

STANDING COMMITTEES OF THE FACULTY

SUMMER SESSIONS

(In addition to members of the regular staff)

ELEANOR ALDWORTH	<i>Supervisor of Health Education, Onondaga County, Syracuse, New York</i>
THOMPSON BAXTER.....	<i>Curriculum Director, Langhorne-Middletown School District, Bucks County</i>
ELIZABETH BRADLEY.....	<i>Cooperative Education Services, Riverhead, New York</i>
W. W. ESHELMAN.....	<i>Supervising Principal, Upper Dublin Township, Fort Washington, Pennsylvania</i>
OLIVER S. HECKMAN.....	<i>Supervising Principal, Langhorne-Middletown School District, Langhorne, Pennsylvania</i>
LEON C. HOOD.....	<i>Senior High School, East Orange, New Jersey</i>
NATALIE A. LEAF.....	<i>Art Supervisor, West Chester, Pennsylvania</i>
JOHN W. LEWIS	<i>Assistant Superintendent of Schools, Baltimore, Maryland</i>
WAYNE LOWE.....	<i>Superintendent of Schools, Dobbs Ferry, New York</i>
JOSEPH S. NEIDIG	<i>Superintendent of Schools, Quakertown, Pennsylvania</i>
JAMES J. O'BRIEN.....	<i>Supervisor of Guidance and Special Services, Linden Public Schools, Linden, New Jersey</i>
WILLIAM C. SPENSER.....	<i>Principal, Agnes Russell Center, Teachers College, Columbia University, New York, New York</i>
FRANK O. STANGEL.....	<i>Supervisor of Health Education, Milwaukee Public Schools, Milwaukee, Wisconsin</i>
THOMAS W. WATKINS.....	<i>Supervising Principal, Coopersburg, Pennsylvania</i>

STANDING COMMITTEES OF THE FACULTY

(The term of each member expires in June of the year given in parentheses after his name. The President is ex officio a member of all committees.)

ADMISSIONS: Dean Congdon, Acting Registrar Wagner, Acting Director of Admissions Campbell (*ex officio*), Professors Shook (1951), Diamond (1952), Cutler (1953), J. D. Mack (1954), Butts, (1955), Ziegler (1956).

- ADVANCED STANDING: Acting Registrar Wagner, Acting Director of Admissions Campbell (*ex officio*), Professors Smail (1951), Sawyer (1952), Serfass (1953), Whitcomb (1954).
- DISCIPLINE: Dean Congdon (*ex officio*), Librarian J. D. Mack (1952), Professor Karakash (1953), and two student members: Charles E. Haltenhoff, James L. Gill.
- EDUCATIONAL POLICY: Deans Congdon, Allen, Neville, More, and Professor Bewley (*ex officio*), Professors Riley (1951), Ford (1952), Harmon (1953), Myers (1954), Bratt (1955); Secretary, Acting Registrar Wagner.
- HONORARY DEGREES: Professors S. J. Thomas (1951), Bradford (1952), Myers (1953), Eney (1954), Harmon (1955), Crum (1956).
- HOUSE COMMITTEE, DROWN MEMORIAL HALL: Chaplain Bean (*ex officio*), and two student members: John H. Miller, Edward Davidheiser.
- INSPECTION TRIPS: Professors Gallagher (1951), Jackson (1952), Libsch (1953), W. L. Jenkins (1954), Crispen (1955).
- PETITIONS: Acting Registrar Wagner (*ex officio*), Professors Gault (1951), Kubelius (1951), Hartman (1952), Barthold (1952), Fornoff (1953), Jacobi (1953).
- PUBLICATIONS, BOARD OF: Associate Dean Seidle, Professor McFadden, Messrs. Hutchins, Moravec (*ex officio*), Professor Fornoff, and four student members: William L. Clayton, Thomas H. Mohr, Stanley Tobol, Jack S. Vanderryn.
- ROSTER: Acting Registrar Wagner (*ex officio*), Professors Strauch (1951), Billinger (1952), Hartman (1953), Farné (1954).
- STANDING OF STUDENTS: Deans Congdon, Allen, More, Professors Bewley, Callen, Doan, Eney, Myers, Stuart, D. E. Mack, Serfass, Acting Registrar Wagner, Director of G.C.D. H. P. Thomas, Acting Director of Admissions Campbell (all members *ex officio*).
- STUDENT ACTIVITIES: Associate Dean Seidle (*ex officio*), Professors Aiken (1951), Rights (1952), and three student members: James J. Keller, Peter G. Murphy, Harold M. Saydah, Jr.
- STUDENT CLUB FINANCES: Associate Dean Seidle (*ex officio*), Professors Cutler (1951), Sherman (1952), and three student members: John H. Miller, William G. Wood, Charles K. Zug, 3rd.
- SUMMER SESSIONS: Director H. P. Thomas (*ex officio*), Professors Bradford (1951), VanArnam (1952), Trembley (1953), Kyte (1954), Lazenby (1955).

SPECIAL STANDING COMMITTEES

STUDENT APPRAISAL OF INSTRUCTORS: Dean Congdon, Chairman (1951), Professors Teal (1952), F. B. Jensen (1953), C. D. Jensen (1954), Christensen (1955).

ART EXHIBITIONS: Professors Quirk, Van Arnam, Criswell, Schuchard.

ATHLETIC ELIGIBILITY: Professors Sadler (*ex officio*), H. P. Thomas (1951), Barthold (1952), Karakash (1953), Mr. Franz (1954), Associate Dean Leith (1955).

BOSEY REITER CUP: Dean Congdon, Chaplain Bean, Mr. Franz.

CATALOG: Messrs. Herrick, Driver (*ex officiiis*), Deans Congdon, More, Neville, Allen, Professor Bewley.

CHAPEL: Chaplain Bean, Dean Congdon (*ex officiiis*), Professors Eney (1951), R. M. Davis (1952), Aiken (1953).

EXECUTIVE COMMITTEE OF THE GRADUATE FACULTY: President Whitaker, Vice President Smiley, Dean Neville (*ex officiiis*), Professors Jensen (1951), Harmon (1952), Myers (1953), Severs (1954), Hartman (1955).

FELLOWSHIPS AND GRADUATE SCHOLARSHIPS: Vice President Smiley, Treasurer Kirkpatrick, Dean Neville.

FORMAL UNIVERSITY EXERCISES: Professors Sadler, V. R. Miller, S. J. Thomas, Associate Dean Leith, Mr. Herrick.

INSTITUTE OF RESEARCH: President Whitaker, Dean Neville (*ex officiiis*), Professors Ford (1951), Serfass (1951), Diamond (1952), Bates (1952), C. D. Jensen (1953), Willard (1953).

LIBRARY: Librarian J. D. Mack (*ex officio*), Professors F. B. Jensen (1951), Karakash (1952), Kyte (1953), Pitcher (1954), C. Curtis (1955).

MUSIC: Professor Schempf, Chaplain Bean, Mr. Herrick, Professor Lamson.

PLACEMENT: Professor Teal, Dean Congdon (*ex officiiis*), Professors Bewley (1951), Bratt (1952), H. P. Thomas (1953).

PROFESSIONAL ENGINEERING DEGREES: Professors Callén (1951), Doan (1952), Eney (1953), D. E. Mack (1954).

SCHOLARSHIPS AND LOANS: Dean Congdon, Vice President Smiley, Treasurer Kirkpatrick.

STUDENT CONCERT-LECTURES: Mr. Moravec, Professors Schempf, Shook.

WILLIAMS SENIOR PRIZES: Professors Severs, Chairman, Bradford, H. B. Davis, Ford, Harmon, Ziegler.

ALFRED NOBLE ROBINSON AWARD COMMITTEE: Professor Diamond, Chairman (1951), Treasurer Kirkpatrick (1952), Professors Raynor (1953), Eney (1954), with Deans Neville, Allen, More (*ex officiiis*).

Lehigh University

Lehigh University is a non-denominational private institution. It offers undergraduate and graduate work in liberal arts, business administration, and engineering, and a limited number of courses in adult education. Candidacy for baccalaureate degrees is restricted to men, with women being admitted on the same terms as men to the Graduate School, Summer Session, and Adult Education Program.

The main part of the physical plant is located on South Mountain, overlooking the City of Bethlehem, Pennsylvania. A field house, a gymnasium, and playing fields on the north side of the city supplement the athletic and recreational facilities of the University. Details of the various facilities will be found in the section on buildings and grounds.

Lehigh was founded in 1865 as the result of a movement to provide an opportunity for young men to obtain a complete education in technical, literary, and scientific fields. The Honorable Asa Packer of Mauch Chunk initiated the movement to organize the University and made it possible by his contribution of a large tract of land and the sum of \$500,000, to which he made generous additions during his lifetime and by his will. The Right Reverend William Bacon Stevens, Bishop of the Diocese of Pennsylvania, was outstanding among Judge Packer's advisers.

A school primarily technical to serve the youth of the Lehigh Valley was the original thought of the founder. However, as the details of the plan were worked out, the scope of the educational services contemplated was broadened greatly. The new institution, which opened its doors to young men from the entire country, was given the character of a small university, combining in a unique fashion the traditional American college of liberal arts, the Continental university, and the Continental technical institute of university rank. Opportunity to pursue advanced work and research was offered in addition to training in the fundamentals of cultural and scientific studies.

The premise adopted at the time of the founding of the university is followed today. To provide a sound basis for successful living in the full sense of the phrase, an education must combine the acquisition of knowledge and skills fundamental in the pro-

fessions with courses designed to broaden the vision and enrich the personal life of the individual. Requirements for graduation therefore include studies preparatory to a career and a generous number of courses which will acquaint the student with the nature and problems of the world in which he lives and will develop him as an individual.

The required core of each major is a sequence of courses which experience has proved to be indispensable in the field chosen. Individual interests and aptitudes are provided for by electives and, where possible, by optional majors within curricula. The organization of the institution as a small university enables students enrolled in one college to pursue in other colleges studies for which they are qualified and from which they may profit. It also enables students who discover their choice of curriculum to be ill-founded to transfer to a curriculum more suited to their interests and abilities. An advisory system, partly compulsory and partly voluntary, insures that the student will seek and obtain advice in planning for his career. He will also have an opportunity to discuss with qualified and sympathetic advisers problems related to his course of study and problems of a personal nature.

Supplementing the formal academic program is an extensive program of extra-curricular activities, in all of which students have the assistance of competent faculty advisers.

Admission Requirements

The enrollment of Lehigh University is strictly limited by action of its board of trustees, with a resulting limitation in the number of candidates who can be admitted each year in the several divisions of the University. In the selective procedure necessitated by this limitation, the University, through its Office of Admissions, takes into account a number of criteria, which are believed to have some individual validity, and in combination a high degree of validity, in predicting probable success in college work. The object is to select those candidates who are most likely to profit fully by the programs offered at this University.

Qualified women may be admitted to pursue work on the graduate level or courses offered in the Adult Education Program. Undergraduate courses may be taken by women only during the summer.

HIGH SCHOOL CREDITS

All candidates must offer fifteen units of entrance credit, by certificate from an accredited school, or by examination, or by a combination of these methods. The fifteen units represent the quantitative equivalent of the usual four-year high school or preparatory school course and must include certain prescribed subjects, together with sufficient electives to make up the required total. The only subjects prescribed are those which are essential prerequisites for college courses which the student should take in his first year in the University.

For the several colleges within the University, the prescribed subjects and the number of electives are as follows:

For the College of Arts and Science—

	Units*
English	3
Foreign Language (ordinarily Latin or German or French or Spanish)	2
Elementary and Intermediate Algebra	1½
Plane Geometry	1
Electives	7½
	15

For the College of Business Administration—

	Units*
English	3
Elementary and Intermediate Algebra	1½
Plane Geometry	1
Electives	9½
	15

For the College of Engineering—

	Units*
English	3
Elementary and Intermediate Algebra	1½
Plane Geometry	1
Plane Trigonometry and Logarithms	½
†Electives	9
	15

The electives may be offered in any subject studied under standard conditions in an accredited high school or preparatory school. In general, electives in the fields of foreign language,

*A unit represents a year's study in a single subject in a secondary school, comprising the work of 180 recitation periods (5 periods a week for 36 weeks) of 40 minutes each or the equivalent.

†Solid geometry or advanced algebra is strongly advised but not required for admission to the College of Engineering.

mathematics, history, and science are preferred; but in the case of a superior student the requirements as to electives may be satisfied in whole or in part by courses in commercial subjects, manual arts, or fine arts.

It should be understood, however, that meeting in full the foregoing subject requirements does not insure admission, but insures only eligibility for consideration in the light of remaining criteria.

QUALITY OF WORK

The quality of the student's work will be judged primarily by his rank or relative average grade in his class. Consideration will be given also to the extent to which he has made grades distinctly higher than the passing grade; to evidence of improvement or deterioration in quality in the course of his progress through the secondary school; to his relative success or failure in the particular subjects which he proposes to continue in college; and to the comments and recommendations of his principal or headmaster.

OTHER CRITERIA AND INTERVIEWS

Information with respect to the other qualifications considered, including sound health, emotional stability, intellectual motivation, and established habits of industry and regularity, is obtained from principals and headmasters, and through personal interviews. The University reserves the right to require any candidate for admission to present himself for an interview and to base the selection of candidates in part upon the appraisals obtained through such interviews.

ENTRANCE EXAMINATIONS

All candidates for admission to the freshman class at Lehigh University will be required to write entrance examinations prepared by the College Entrance Examination Board. Ordinarily, candidates for admission to the fall semester who will be graduated from preparatory or high school the preceding June should write the examinations no later than March.

The examinations are required so that supplementary evidence may be obtained as to the applicant's readiness to do successful college work in the curriculum in which he wishes to enroll. The examination results are also used to assist in proper placement of the student during his freshman year.

Satisfactory performance in these examinations will not be regarded as sufficient evidence that an applicant is qualified to undertake college work when his secondary school record is unsatisfactory. On the other hand, a reasonable performance on the entrance examinations is required even of those applicants who have ranked high in preparatory or high school.

Each applicant is requested to write the following tests:

The Scholastic Aptitude Test

The English Composition Achievement Test

And *two additional tests* to be selected by the candidate

Application forms for the Examinations of the College Entrance Examination Board may be secured from the College Entrance Examination Board, P. O. Box 592, Princeton, New Jersey. Applications to write the March examination should reach the College Entrance Examination Board at least one month prior to the date of the examination.

CONTINUOUS PROGRAM OF STUDIES

The Continuous Program of Studies has been established to enable secondary school seniors to begin a continuous college education immediately following graduation. Under the new program, students may attend the twelve week Summer Sessions in addition to the regular Fall and Spring semesters. Completion of requirements for the baccalaureate degree in three years will be possible, provided that a proper sequence of courses can be arranged, and high scholastic standards are maintained.

Selected students will be admitted in June, 1951, September, 1951, and February, 1952. The Continuous Program is not mandatory and will not affect students who prefer to take the usual four year course of study.

Admission Procedure

APPLICATIONS FOR ADMISSION

Applications for admission to the University should be submitted to the Office of Admissions, Lehigh University, Bethlehem, Pennsylvania, at the end of the junior year or as early as possible during the applicant's senior year in secondary school. First consideration will be given to applications filed prior to April 1. Appropriate forms of filing applications for admission may be secured from the Office of Admissions.

ACCEPTANCE OF ADMISSION AND DEPOSIT

Each candidate who is notified of admission is required to file with the Office of Admissions, within ten days after such notification, a formal acceptance of his admission, asserting his definite intention to enter Lehigh University on a specified date; and this formal acceptance must be accompanied by a deposit of \$50.00 (check or money order payable to Lehigh University).

This deposit will be applied toward the tuition charges for the first semester; but the deposit is forfeited in case of non-enrollment for the specified semester.

ADMISSION TO ADVANCED STANDING

Candidates for admission by transfer from other institutions may be admitted with advanced standing, subject to the enrollment limitations of the several divisions of the University, provided their college records up to the time of transfer are thoroughly satisfactory to the University. Such candidates must have met the entrance requirements prescribed for undergraduates of Lehigh University.

A student who desires to transfer to Lehigh University from another university, college, or junior college, must submit an official transcript of his record in the other institution; this transcript should include his college credits, a list of the entrance credits accepted for admission to the other institution, and a statement of honorable dismissal. A copy of the catalog of the college or university previously attended should be sent to the Office of Admissions.

A candidate who has attended more than one university, college, or junior college, must present a record from each institu-

tion; failure to submit a complete record of former academic experience will result in cancellation of registration.

Graduates of recognized colleges of liberal arts and sciences whose courses have included a year of physics, a year of chemistry, and mathematics through the calculus may ordinarily earn the degree of B.S. in engineering from Lehigh University on the successful completion of a two-year program which will be individually planned for each candidate.

A student who is planning to transfer to Lehigh University should so arrange his work in college as to cover as many of the subjects of the freshman and sophomore years of the curriculum he selects as possible.

EXAMINATIONS FOR ADVANCED STANDING

Candidates who have completed advanced courses in approved secondary schools may establish advanced standing on the basis of these courses by taking anticipatory examinations. This privilege is granted only on petition, approved by the Office of Admissions and the department or departments concerned; and the examinations are to be taken at times fixed by the University.

Candidates for admission who wish to take examinations for advanced credit in any subject should notify the Office of Admissions at least one month prior to the date of registration.

VACCINATION REQUIREMENT

Smallpox vaccination is required, under the laws of the Commonwealth of Pennsylvania, of all students entering the University. Certificates are accepted for this requirement when the vaccination has been performed within three years of the time of matriculation, has resulted in a true vaccinia (take), and the scar gives evidence of a recent vaccinia. Since the vaccinations at the University are performed and the reactions read by the method recommended by the United States Public Health Service, students are advised to wait until they arrive at the University to have this done.

LATEST DATE FOR REGISTRATION

No registration of new students is accepted later than the tenth day of instruction in any semester.

Undergraduate Fees

The tuition fee for undergraduates carrying fifteen semester hours of work or more is \$350.00 per semester in the College of Engineering and \$312.50 per semester in the College of Arts and Science, the College of Business Administration, and the General College Division. A student regularly enrolled in any of the undergraduate divisions of the University who registers for fewer than fifteen hours of work will pay either \$25.00 for each semester hour carried* or the regular tuition fee for the division in which he is enrolled, whichever amount is lower.

The tuition charge is comprehensive, there being no additional fees for athletics, health service, library, student activities, or student concert-lectures. In addition, there are no matriculation, graduation, or laboratory fees.

MILITARY DEPOSITS. A deposit of \$25.00 is made by each student taking courses in military science and tactics. This deposit is refunded when the government property issued to the student is returned.

CHEMISTRY BREAKAGE. Students taking chemistry laboratory courses are required to reimburse the University for returnable equipment broken or otherwise damaged and for all chemicals used in excess of reasonable amounts. To cover possible charges of this nature, all students registering for laboratory courses in chemistry purchase coupon books, the unused portions of which are redeemed.

EXAMINATION FEES. Students who for satisfactory reasons absent themselves from final examinations will be allowed, upon petition, to take make-up examinations without payment of any examination fee. A fee of \$5.00 is charged for any examination subsequent to the first regular final or make-up examination allowed upon petition in any course. This regulation applies to the psychological and placement examinations required of new students if taken at some time other than that scheduled.

*In computing tuition charges on the semester-hour basis, Engl. 0 is considered a three-hour course.

A fee of \$5.00 is charged for anticipatory examinations taken by students to establish advanced standing on the basis of work completed in secondary schools.

LATE REGISTRATION FEE. A student presenting himself for registration after the last day of registration is subject to a penalty of \$10.00, irrespective of the number of days of delay.

LATE PAYMENT FEE. A student who does not pay his University bill within three days after the date on his registration ticket is subject to a penalty of \$5.00 on the fourth day and \$1.00 for each succeeding day until his bill is paid.

LATE PHYSICAL EXAMINATION FEE. Any student who fails to keep his appointment for his physical examination is charged a late examination fee of \$10.00. If he fails to meet the second appointment or any subsequent appointments, he again becomes subject to the penalty.

REFUNDS. In the event that a student withdraws from the University after the payment of tuition, he is entitled to receive a refund of his total tuition less \$50.00 and less a deduction of two percent of the total tuition paid for each day of instruction completed, computed from the first day of instruction in the semester.

A graduate or adult education or summer session student who formally withdraws from the University is entitled to receive a refund of his total tuition less \$5.00 for each credit hour for which he is registered and less a deduction for each day of instruction of two per cent of the total tuition paid, computed from the first day of instruction in the semester.

In the event of the death of a student or his induction into the armed forces, tuition will be refunded in proportion to the fraction of the semester remaining at the time of his death or induction.

No student who is suspended or expelled from the University shall be entitled to any refunds.

No refunds will be made to any student for any reduction in his schedule after the tenth day of instruction in a regular semester or the corresponding date in a summer session.

Estimate of Expenses

Expenses of undergraduates vary somewhat according to the habits and tastes of the individual students. There are certain basic expenses, however, which must be met by all students; and these are listed below. A schedule of necessary expenses for the two semesters of the freshman year might be constructed as follows:

<i>Colleges of Arts and Science and Business Administration</i>			<i>College of Engineering</i>	
First Semester	Minimum	Average	Minimum	Average
Tuition	\$312.50	\$312.50	\$350.00	\$350.00
Books	25.00	30.00	30.00	35.00
Supplies	5.00	10.00	20.00*	25.00*
†Board	160.00	200.00	160.00	200.00
Room	50.00**	75.00	50.00**	75.00
Military Deposit	25.00***	25.00***	25.00***	25.00***
	\$577.50	\$652.50	\$635.00	\$710.00
 Second Semester	Minimum	Average	Minimum	Average
Tuition	\$312.50	\$312.50	\$350.00	\$350.00
Books & Supplies	10.00	15.00	15.00	20.00
†Board	160.00	200.00	160.00	200.00
Room	50.00**	75.00	50.00**	75.00
	\$532.50	\$602.50	\$575.00	\$645.00
Total	\$1110.00	\$1255.00	\$1210.00	\$1355.00

Items of personal expense, clothes, travel, and the like cannot be estimated except for each student individually, according to his personal habits and circumstances. If a prospective student plans to accept an invitation to join a fraternity he should anticipate an additional annual cost of approximately \$90.00 plus the amount of initiation fee.

Books, stationery, and drawing instruments may be purchased at the Supply Bureau in the Alumni Memorial Building.

*These figures do not include drawing instruments nor slide rule. The latter vary in price, but adequate drawing instruments may be purchased at about \$18.00 and slide rules at about \$16.00.

**There are a limited number of dormitory rooms at \$35.00 per semester. Ordinarily these rooms are not available to freshmen.

***Returned at the end of the year.

†See page 48.

Living Quarters and Board

DORMITORIES

The University has five permanent dormitories located on the college campus with a total capacity of 1030 students.

All freshmen are required to reside in the University dormitories on the campus, except those who live within commuting distance and prefer to live at home, and married students who establish their homes in the Bethlehem area.

Rentals in the permanent dormitories range from \$50.00 to \$125.00 per student per semester.

In addition to the permanent dormitories, there are three temporary quonset huts on the campus with accommodations for 120, in which rentals are \$35.00 and \$50.00 per semester per student. Applicants for these temporary quarters are advised to inspect them before signing leases, if at all possible.

Information regarding all dormitories can be obtained from the Office of Admissions.

APARTMENTS

To the extent of its ability, the University assists married students in obtaining furnished or unfurnished apartments. Twenty-eight two and three-room unfurnished apartments in converted wooden barracks, located on East Laurel Street on the north side of the city, are maintained by the University for rental to students and staff members who are veterans.

Married students who are not veterans and veterans who can not be accommodated in the Laurel Street apartments are referred to the Bureau of Housing Information for such assistance as this agency can render. A personal visit to the Bureau, well in advance of the date on which the student expects to enroll at the University, is highly advisable.

DINING SERVICE

The University operates a cafeteria in Lamberton Hall for the accommodation of the student body. Eating at the cafeteria is on a voluntary basis. Board is not furnished on a weekly, monthly or semester basis. Regular meals are served daily from Monday through Saturday noon while the University is in session.

The College of
Arts and Science

The College of Arts and Science

Administrative Officers

Martin Dewey Whitaker, *President*

Earl Kenneth Smiley, *Vice-President*

Robert Pattison More, *Dean of the College of Arts
and Science*

Wray Hollowell Congdon, *Dean of Students*

Clarence Bowen Campbell, *Acting Director of
Admissions*

James Harold Wagner, *Acting Registrar*

The College of Arts and Science of Lehigh University comprises the departments of biology, classical languages, education, English, fine arts, geology, German, history and government, international relations, mathematics and astronomy, music, philosophy, psychology, religion, and romance languages. Courses in economics, sociology, accounting, and finance are provided by the College of Business Administration; physics and chemistry are supplied by the College of Engineering.

The degree of Bachelor of Arts is conferred upon graduates of the College of Arts and Science.

REQUIREMENTS FOR GRADUATION

1. The completion of one hundred twenty credit hours of collegiate work, apportioned so as to cover the distribution and concentration requirements, in addition to military science and tactics, and physical education, required of all students.
2. The passing of a comprehensive examination in the major field.

THE COURSE OF STUDY

Each student in the College of Arts and Science is considered from the beginning of his course as an individual. The College expects every student to have a well-defined purpose at entrance, but recognizes the student's right to change his objective, and for that reason gives him two years in which to find himself and establish the direction of his future career. To help the student in his decision, the College provides an advisory staff consisting of the dean of the College, who is adviser of freshmen, and the heads of departments in which major sequences are given. The individual program for each student is outlined tentatively in an interview with the dean of the College during freshman week. This preliminary program is determined by the nature and quality of the student's preparation and by the student's personal interests. The final program, which is made out in detail at the end of the sophomore year, takes into account, in addition, demonstrated aptitudes and pre-professional or vocational needs.

These individual programs admit of considerable elective choice. The number of elective courses depends upon the demands of the distribution and concentration requirements, which occupy from sixty to eighty per cent of the student's time. The number of purely elective hours ranges from twenty-one to forty-five out of the hundred and twenty required for graduation. In general, the student in the College of Arts and Science may elect any undergraduate course given at the University for which he has the prerequisites. This privilege, combined with the wide choice offered by the major sequences, *i. e.*, the concentration requirements, enables the College to provide specialization in a large number of fields and preparation for individual careers.

PREPARATION FOR PROFESSIONAL SCHOOLS
AND THE PROFESSIONS

The College of Arts and Science provides the preliminary training necessary for admission to the various graduate schools and, in some cases, prepares directly for a profession. Since a large proportion of the graduates of the College of Arts and Science of Lehigh University continue their work in graduate schools, the College offers a number of course combinations designed to give

preliminary training for the various fields of medicine, dentistry, public service, public health, law, theology, engineering, business administration, etc. Students who are looking forward toward any one of the graduate schools should consult the dean of the College, who will assist them in planning their courses.

THE FIVE YEAR COMBINED COURSE IN ARTS AND ENGINEERING

Students who are looking forward to a career in engineering and can afford the time and expense are advised to enroll in the five-year combined course. Such students will meet all the distribution requirements of the College of Arts and Science. Those who are preparing for chemical, civil, industrial, mechanical, metallurgical, or mining engineering will take as a major sequence all of the work in science, mathematics, and engineering prescribed for the first three years of the engineering curriculum of their choice. Their senior comprehensive examination will normally be the Graduate Record Examination in engineering (or in chemistry). Students who plan to combine the curriculum in Arts and Science with either the curriculum leading to the B.S. in Chemistry, or that leading to the B.S. in Engineering Physics, will take as their major sequence the regular major in chemistry or in physics, as the case may be.

At the end of four years of successful study, the B.A. degree is conferred. For the fifth year, the student transfers to the College of Engineering and completes the requirements for the engineering degree in one more year. The dean of the College of Arts and Science is the adviser of all men taking the combined course until they transfer to the College of Engineering.

THE CURRICULUM

The curriculum is based upon the principles of distribution and concentration. The object of the distribution requirements is to give the student an elementary knowledge of the fields of contemporary thought and to orient him in the world of man and nature.

Distribution Requirements

The distribution requirements are administered by the dean of the College of Arts and Science in accord with the group regulations given below. The subjects required of the individual student depend in part upon the field in which he expects to major, in part upon his personal preference, and in part upon the subjects he has taken in secondary school.

GROUP I

ENGLISH. The normal requirement in English is Engl. 1 and 2, Composition and Literature, six semester hours, in the freshman year, and six semester hours of English or American literature in the sophomore year, a total of twelve hours. Students who demonstrate satisfactory ability in written composition in the freshman placement tests will meet the distribution requirement by passing Engl. 11 and 12, Types of World Literature, six semester hours. Three extra hours of composition, carrying no credit toward graduation, must be taken and passed by those whose preparation, as evidenced by the placement tests, has been poor.

FOREIGN LANGUAGES. Students in the College of Arts and Science normally are required to complete successfully the equivalent of two years of college work in one foreign language beyond the elementary level, the latter term being understood to mean two years in secondary school or one year in college. The requirement may be met either by passing an examination or by pursuing in course the language to be used in satisfaction of the requirement. Students who present at entrance three or four years of a foreign language may meet this requirement with one year of advanced college work.

An option is offered those who find it necessary or, as part of their preparation for chosen fields of endeavor, desirable to pursue in college the study of foreign languages other than the language or languages studied in secondary school. Such students may offer in satisfaction of the language requirement two years of one foreign language and one year of another.

FINE ARTS OR MUSIC. Three semester hours.

PHILOSOPHY OR RELIGION. Three semester hours.

GROUP II

SCIENCE. Twelve semester hours, chosen from at least three of the following fields: astronomy, biology, chemistry, geology, mathematics, physics, psychology.

Normally, a student will take work in fields not represented among those studied in secondary school. However, if work taken in secondary school is not regarded as being the equivalent of prerequisites of courses which the student expects to take later, he will take the Lehigh courses specified as prerequisites, and full credit for the latter will be given toward the satisfaction of the distribution requirement.

GROUP III

SOCIAL SCIENCE. Twelve semester hours, chosen from at least three of the following fields: ancient civilization, economics, education, government, history, international relations, sociology.

Concentration Requirements

During the second semester of the freshman year each student must select some sequence of studies as his major field. A major consists of at least twelve semester hours of advanced work in the field chosen. Including preliminary college work, the minimum number of hours constituting a major is twenty-four. Change of major is permitted up to the end of the sophomore year. Majors must be approved by the professors concerned and the dean of the College.

The major work is designed to enable a student to master his chosen field so far as that is possible in the two years devoted to the subject. In all fields certain courses are prescribed, but the mere passing of courses will not satisfy the major requirements. It is expected that the student will read widely in his subject and prepare himself largely through his own reading and his own independent work for his final comprehensive examination. After a student has selected a major subject, the head of the department in which the major is selected becomes the official adviser of the student and guides him in his choice of courses.

Comprehensive Examination

A comprehensive examination in the major subject is required of all students. This examination is given at the end of the senior year and may be oral or written or both. The comprehensive examination is given under the direction of the head of the major department. At least two university teachers and, whenever possible, representatives of at least two departments take part in the examination.

No student is allowed to take the senior comprehensive examination more than twice in any one field. In case of failure on the first attempt, a second trial is not permitted until a period of three months has passed.

UNSCHEDULED WORK

On the advice of the head of the department in which the major work is being done and with the consent of the dean of the College, a senior of unusual merit who wishes to concentrate in his chosen field may be allowed to substitute not more than six hours of unscheduled work per semester for six hours of other work required for graduation.

SPECIAL HONORS

Special honors are awarded at the end of the senior year, on recommendation of the head of the department concerned and by vote of the faculty, to students who have done advanced work of unusual merit in some chosen field. Candidates for special honors must indicate during their junior year their intention to work for such honors. Awards are based on grades obtained in the subject chosen, the results in extra work assigned, and the general proficiency of the candidate as evidenced by either a final examination or a thesis, as the head of the department involved may direct. No student who fails to pass his comprehensive examination with distinction is graduated with special honors.

SPECIAL REGULATIONS FOR ENGLISH

Students in the College of Arts and Science who persistently use poor English may be reported at any time to the dean of the College. He may require that they take additional English without credit toward graduation.

Toward the end of the junior year each junior in the College of Arts and Science must report to the department of English for an exercise in impromptu writing. Students found seriously deficient in this test are reported to the dean of the College, who may require that they take additional English without credit toward graduation.

DETAILS OF CONCENTRATION REQUIREMENTS

Major Sequences

BIOLOGY. Three majors are offered by the department of biology: zoology, botany, and bacteriology.

Zoology. This major is designed for men who intend to enter medical school or to continue advanced instruction in a graduate school.

Required Courses: Elementary

Biol. 31, 32. Zoology(6)

Required Courses: Advanced

Biol. 3. Comparative Anatomy(3)
 Biol. 4. Embryology(3)
 Biol. 6. Botany(3)
 Biol. 18. Genetics(2)
 Biol. 61, 62. Bacteriology(6)
 Biol. 120. Physiology(3)
 Biol. 313. Histology(3)
 Biol. 358. Immunology(3)

Botany. This major is for men who intend to enter the teaching profession, or to do research in agriculture or in the economic phases of the science.

Required Courses: Elementary

Biol. 31, 32. Zoology(6)

Required Courses: Advanced

Biol. 6. Botany(3)
 Biol. 18. Genetics(2)
 Biol. 36. Economic Botany(3)
 Biol. 61, 62. Bacteriology(6)

Bacteriology. This major is for men who intend to go into public health work or bacteriology either upon graduation or in pursuance of graduate study.

Required Courses: Elementary

Biol. 31, 32. Zoology(6)

Required Courses: Advanced

Biol. 6. Botany(3)
 Biol. 18. Genetics(2)
 Biol. 61, 62. Bacteriology(6)
 Biol. 313. Histology(3)
 Biol. 358. Immunology(3)

Suggested Electives

Biol. 355.	Industrial Bacteriology	(3)
Biol. 361.	Public Sanitation	(3)

Collateral Courses Required of All Majors

Chem. 4.	5. General Chemistry	(8)
Chem. 35.	Analytical Chemistry	(4)
Chem. 93.	Elements of Physical Chemistry	(3)
Chem. 150, 151.	Organic Chemistry	(6)
Chem. 165.	Organic Chemistry Laboratory	(2)
Phys. 12.	Introduction to Physics	(3)
Phys. 16.	General Physics	(3)
Phys. 17.	General Physics Laboratory	(2)

A reading knowledge of both French and German should be attained before graduation.

CHEMISTRY.

Required Courses: Elementary

Chem. 4.	5. General Chemistry	(8)
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Required Courses: Advanced

Chem. 35, 36.	Analytical Chemistry	(8)
Chem. 91.	Physical Chemistry	(3)
Chem. 92.	Physical Chemistry Laboratory	(1)
Chem. 150, 151.	Organic Chemistry	(6)
Chem. 165, 167.	Organic Chemistry Laboratory	(4)
Chem. 190.	Physical Chemistry	(3)
Chem. 192.	Physical Chemistry Laboratory	(1)
Chem. 194.	Physical Chemistry and Electrochemistry	(3)
Chem. 197.	Electrochemistry Laboratory	(1)
Chem. 302.	Inorganic Chemistry	(3)
and at least one of the following:		
Chem. 337.	Advanced Analytical Chemistry	(3)
Chem. 357.	Qualitative Organic Chemistry	(3)
Chem. 358.	Advanced Organic Chemistry	(3)
Chem. 371.	Elements of Biochemistry	(3)

Required Collateral Courses

Math. 11.	Analytical Geometry and Beginning Calculus	(3)
Math. 12.	Elementary Differential and Integral Calculus	(3)
Math. 13.	Calculus and Solid Analytic Geometry	(3)
and either		
Phys. 12.	Introduction to Physics	(3)
Phys. 16.	General Physics	(3)
Phys. 17.	General Physics Laboratory	(2)
or		
Phys. 22.	Mechanics and Properties of Matter	(4)
Phys. 23.	Heat, Sound and Light	(4)
Phys. 24.	Electricity and Magnetism	(4)

CLASSICAL LANGUAGES. Students who select Greek and Latin as a major will choose one of two groups of courses:

Group 1 (Emphasis upon Greek).

Required Courses: Elementary

Gk. 1, 2.	Elementary Greek	(6)
Gk. 3, 4.	Second-Year Greek	(6)

ARTS AND SCIENCE

Required Courses: Advanced

Gk. 7.	Thucydides	(3)
Gk. 8.	Tragedy	(3)
Gk. 9.	Dramatic Poetry	(3)
Gk. 10.	Greek Oratory	(3)
Gk. 116.	Plato	(3)
Gk. 21.	Ancient History	(3)
Lat. 22.	Ancient History	(3)
Gk. 200.	Greek Literature in English Translation	(3)
Lat. 201.	Latin Literature in English Translation	(3)

Six hours of Latin language, specific courses depending on the student's preparation.

Group 2 (Emphasis upon Latin).

Required Courses: Elementary

Lat. 61.	Beginning Latin	(3)
Lat. 62, 63.	Caesar	(6)
Lat. 64.	Cicero	(3)

Required Courses: Advanced

Lat. 65.	Vergil	(3)
Lat. 66.	Horace	(3)
Lat. 67.	Prose Writers	(3)
Lat. 68.	Latin Drama	(3)
Lat. 169.	Satire	(3)
Gk. 21.	Ancient History	(3)
Lat. 22.	Ancient History	(3)
Lat. 201.	Latin Literature in English Translation	(3)
Gk. 200.	Greek Literature in English Translation	(3)

Six hours of Greek language, specific courses depending upon the student's preparation.

Suggested Electives

Phil. 14.	Logic and Scientific Method	(3)
Phil. 231.	Ancient and Medieval Philosophy	(3)
Govt. 1.	The Foundations of Government	(3)
Hist. 25.	European History	(3)
Astr. 1.	Descriptive Astronomy	(3)
Astr. 2.	General Astronomy	(3)
Educ. 330.	History of Education in Europe	(3)

CONSERVATION.

Required Courses

Biol. 6.	Botany	(3)
Biol. 18.	Genetics	(2)
Biol. 31, 32.	Zoology	(6)
Biol. 36.	Economic Botany	(3)
Biol. 61.	Bacteriology	(3)
Biol. 206.	Natural History and Ecology	(3)
Chem. 4, 5.	General Chemistry	(8)
Chem. 35.	Analytical Chemistry	(4)
Chem. 150.	Organic Chemistry	(3)
Geol. 1.	Principles of Geology	(3)
Geol. 12.	Historical Geology	(3)
Geol. 31.	Mineralogy	(3)
Geol. 32.	Petrology	(3)
Geol. 43.	Cartography	(1)
Geol. 361, 362.	Earth Science Applied to Conservation	(6)
Geol. 371.	Meteorology	(3)
Geol. 372.	Climatology	(3)
Math. 1.	Trigonometry	(3)
Phys. 12.	Introduction to Physics	(3)
Phys. 16.	General Physics	(3)

LEHIGH UNIVERSITY

Recommended and Optional Courses

Chem. 36.	Analytical Chemistry	(4)
C.E. 40.	Land and Topographical Surveying	(3)
Geol. 181 or 182.	Geological Problems	(1-4)
Geol. 223.	Structural Geology	(3)
Geol. 312.	Stratigraphy and Sedimentation	(3)
Geol. 331.	Optical Crystallography	(3)
Geol. 332.	Petrography	(3)
Geol. 342 or 344.	Field Trip	(1)
Math. 42.	Introduction to Mathematics of Statistics	(3)

ECONOMICS AND BUSINESS ADMINISTRATION. Three majors are offered in the field of economics and business administration: economics, finance, and accounting.

ECONOMICS.

Required Courses: Elementary

SOPHOMORE YEAR

Eco. 3,	4. Economics	(6)
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Required Courses: Advanced

JUNIOR YEAR

Eco. 206.	Intermediate Economic Theory	(3)
Eco. 207.	Advanced Economics	(6)
E.S. 145.	Statistical Method	(3)
E.S. 246.	Business Cycles and Forecasting	(3)
Fin. 129,	130. Money and Banking	(6)

SENIOR YEAR

Eco. 233.	Labor Problems	(3)
Eco. 236.	Public Utilities	(3)
Fin. 241.	International Trade and Finance	(3)
Fin. 251.	Public Finance: Federal	(3)
Soc. 262.	Social Problems	(3)

Suggested Electives

Acctg. 104.	Accounting for Engineers	(3)
Eco. 111.	Marketing	(3)
Eco. 235.	Transportation	(3)
E.S. 247.	National Income Analysis	(3)
Hist. 327,	328. Development of American Institutions	(6)
Govt. 357.	City Government	(3)
Govt. 360.	Public Administration	(3)
I.E. 102,	103. Industrial Management	(6)
Soc. 42.	Principles of Sociology	(3)

Finance.

Required Courses: Elementary

SOPHOMORE YEAR

Eco. 3,	4. Economics	(6)
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Required Courses: Advanced

JUNIOR YEAR

Fin. 125,	126. Corporation Finance	(6)
Fin. 129,	130. Money and Banking	(6)
E.S. 145.	Statistical Method	(3)
E.S. 246.	Business Cycles and Forecasting	(3)

SENIOR YEAR

Eco. 160.		Insurance	(3)
Eco. 233	or 234.	Labor Problems	(3)
Fin. 223.		Investments	(3)
Fin. 241.	242.	International Trade and Finance	(6)
Fin. 251.		Public Finance: Federal	(3)

Suggested Electives

Acctg. 1,	2.	Accounting	(6)
Acctg. 213,	214.	Intermediate Accounting	(6)
Eco. 207,	208.	Advanced Economics	(6)
Eco. 233	or 234.	Labor Problems	(3)
Fin. 231.		Bank Credit Problems	(3)
Fin. 232.		Monetary and Credit Policies	(3)
Fin. 271,	272.	Readings in Finance	(6)

Accounting.

Required Courses: Elementary

SOPHOMORE YEAR

Acctg. 1,	2.	Accounting ..	(6)
Eco. 3,	4.	Economics	(6)

Required Courses: Advanced

JUNIOR YEAR

Acctg. 115.		Cost Accounting	(3)
Acctg. 213,	214.	Intermediate Accounting	(6)
Acctg. 218.		Advanced Cost Accounting	(3)
Fin. 125,	126.	Corporation Finance	(6)

SENIOR YEAR

Acctg. 219.		Specialized Accounting Systems	(3)
Acctg. 220.		Auditing	(3)
Law 101,	102.	Business Law	(6)
Law 103.		Federal Tax Law	(3)

Suggested Electives

Eco. 206.		Intermediate Economic Theory	(3)
E.S. 145.		Statistical Method	(3)
E.S. 246.		Business Cycles and Forecasting	(3)
Fin. 223.		Investments ..	(3)

Education.

Required Courses: Elementary

Educ. 1.		Introduction to Education	(3)
Educ. 20.		Educational Psychology	(3)

Required Courses: Advanced

Educ. 152.		Principles of High School Teaching	(3)
Educ. 153.		Observation of Secondary School Teaching	(3)
Educ. 154.		Practice Teaching of Secondary School Subjects	(3)
Educ. 331.		History of Education in the United States	(3)
Educ. 350.		Principles of Secondary Education	(3)
Educ. 351.		Organization of Materials of Instruction	(3)
		Electives	(6)

ENGLISH. Two majors are offered by the department of English: English Literature, and Journalism.

ENGLISH LITERATURE. Students looking forward to teaching English or taking graduate courses for advanced degrees should elect this major.

Required Courses: Elementary

Engl.	1, 2.	Composition and Literature	(6)
or			
Engl.	11, 12.	Types of World Literature	(6)
and six		semester hours from the following courses:	
Engl.	4, 5.	A Study of the Drama	(6)
Engl.	8, 9.	English Literature	(6)
Engl.	20, 21.	American literature	(6)
Engl.	35.	Types of Poetry	(3)
Engl.	11, 12.	Types of World Literature	(6)

Required Courses: Advanced

Engl.	323, 324.	Shakespeare and the Elizabethan Drama	(6)
and eighteen		semester hours from the following courses:	
Engl.	183, 184.	Readings in English Literature	(6)
Engl.	321.	Contemporary American Literature	(3)
Engl.	322.	Contemporary English Literature	(3)
Engl.	325.	English Literature of the Romantic Era	(3)
Engl.	326.	English Literature of the Victorian Era	(3)
Engl.	331.	Milton	(3)
Engl.	333.	Restoration and Augustan Literature	(3)
Engl.	334.	The Age of Johnson	(3)
Engl.	335.	History of the English Language	(3)
Engl.	336.	Writing for Publication	(3)
Engl.	337.	The Renaissance	(3)
Engl.	338.	The Seventeenth Century	(3)

Students planning to pursue graduate studies should have a reading knowledge of German, French, and Latin.

Journalism.

Required Courses: Elementary

Engl.	1, 2.	Composition and Literature	(6)
or			
Engl.	11, 12.	Types of World Literature	(6)
		English Literature	(6)
Journ.	1-4.	Brown and White, four semesters	(4)

Required Courses: Advanced

Journ.	11.	Newspaper Reporting and Writing	(3)
Journ.	12.	Advanced Newspaper Reporting and Writing	(3)
Journ.	13.	Newspaper Editing and Copyreading	(3)
Journ.	15.	Editorial Writing	(3)
Journ.	16.	Newspaper Problems and Policies	(3)
Journ.	118.	History of American Journalism	(3)
Journ.	120.	Journalism Proseminar	(3)

Suggested Electives

Journ.	14.	Press Photography	(3)
Journ.	23.	Editing the House Organ and Trade Publication	(3)
Journ.	31, 32.	Community Journalism	(6)
Eco.	3, 4.	Economics	(6)
Eco.	111.	Marketing	(3)
Eco.	113.	Advertising	(3)
Eco.	233, 234.	Labor Problems	(6)
Govt.	51.	American National Government	(3)
Govt.	52.	American State and Local Government	(3)

Govt.	357.	City Government	(3)
Govt.	360.	Public Administration	(3)
Hist.	25, 26.	European History	(6)
Hist.	329, 330.	American Foreign Policy	(6)
Soc.	42.	Principles of Sociology	(3)
Soc.	262.	Social Problems	(3)

FINE ARTS.

Required Courses: Elementary

F.A.	11.	Ancient and Medieval Art	(3)
F.A.	12.	The Art of the Italian Renaissance	(3)

Required Courses: Advanced

F.A.	3, 4.	History of Architecture	(6)
F.A.	13.	The Art of the Northern Renaissance	(3)
F.A.	14.	Modern Art	(3)
F.A.	17, 18.	Criticism and Analysis of Art	(6)

Suggested Electives

F.A.	5, 6.	Drawing and Painting	(6)
F.A.	7, 8.	Advanced Drawing and Painting	(6)
Mus.	13, 14.	Introduction to Music Literature	(6)
Phil.	151.	Esthetics	(3)

Courses in history and foreign language.

GEOLOGY.

Required Courses: Elementary

Geol.	1.	Principles of Geology	(3)
Geol.	12.	Historical Geology	(3)
Geol.	31.	Mineralogy	(3)
Geol.	32.	Petrology	(3)
Geol.	33.	Blowpipe Analysis	(1)

Required Courses: Advanced

Geol.	43.	Cartography	(1)
Geol.	141.	Field Geology	(3)
Geol.	223.	Structural Geology	(3)
Geol.	255, 256.	Mineral Resources	(6)
Geol.	311.	Paleontology	(3)
Geol.	312.	Stratigraphy and Sedimentation	(3)
Geol.	342.	Field Trip	(1)
Geol.	344.	Field Trip	(1)

Required Collateral Courses

Math.	1.	Trigonometry	(3)
C.E.	61.	Engineering Drawing and Descriptive Geometry	(3)
C.E.	40.	Land and Topographic Surveying	(3)
Chem.	4, 5.	General Chemistry	(8)
Phys.	12.	Introduction to Physics	(3)
Phys.	16.	General Physics	(3)
Min.	161.	Mining Engineering	(3)

Suggested Electives

Geol.	146.	Field Problems	(3)
Geol.	181, 182.	Geological Problems	(2-8)
Geol.	331.	Optical Crystallography	(3)
Geol.	332.	Petrography	(3)
Geol.	371.	Meteorology	(3)
Geol.	372.	Climatology	(3)

Certain variations in the major courses and the suggested electives may be made, depending upon the branch of geology in which the student is interested. A reading knowledge of French and German is recommended.

GERMAN.

Required Courses: Elementary

Ger.	1.	2.	Elementary German	(6)
Ger.	3.	4.	Intermediate German	(6)

Required Courses: Advanced

Ger.	9.	Advanced German	(3)
Ger.	10.	Goethe's Faust	(3)
Ger.	13, 14.	Lessing, Goethe, and Schiller	(6)
Ger.	22.	Conversation and Composition	(3)
Ger.	211, 212.	Nineteenth Century German Drama	(6)
Ger.	215, 216.	The German Short Story	(6)

Suggested Electives

Hist.	25.	26.	European History	(6)
Hist.	331.	332.	Intellectual Expansion of Modern Europe	(6)
Phil.	232.		Modern Philosophy	(3)
Phil.	237.		Nineteenth Century Philosophy	(3)

In addition, the student will be expected to have a knowledge of the history of German literature. A list of readings in English and German is furnished the student at the beginning of his major work.

HISTORY AND GOVERNMENT. Four majors are offered by the department of history and government: American history, European history, government and a general major.

Note: Students majoring in history or political science with a view to graduate work leading to the doctorate in either field should plan to acquire a reading knowledge of two foreign languages. The languages likely to be required by graduate schools are French, German, or Spanish.

American History. Students looking forward to teaching American history, or to taking graduate work in this field should take this major. It is also appropriate for the students who contemplate studying law or entering certain branches of foreign service.

Required Courses: Elementary

Hist.	13.	14.	United States History	(3)
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Required Courses: Advanced

Hist.	329.	330.	American Foreign Policy	(6)
Govt.	51.	52.	American Government (National and State)	(6)
and fifteen semester hours to be selected from the following:				
Hist.	27.	28.	European Expansion and Empire Building	(6)
Hist.	251.		Proseminar in United States and Pennsylvania History	(3)
Hist.	319.		Eighteenth Century European Civilization	(3)
Hist.	320.		Eighteenth Century European Imperialism	(3)
Hist.	349.	350.	Hispanic America in the XIX and XX Centuries ..	(6)
Hist.	360.		History of American Political Parties	(3)

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Govt.	2.	American Political Ideas	(3)
Govt.	4.	Political Parties and Electoral Problems	(3)
Govt.	351.	Constitutional Law	(3)

Suggested Electives

Hist.	25, 26.	European History	(6)
Int. Rel.	361, 362.	International Law	(6)
Eco.	3, 4.	Economics	(6)
Eco.	50.	Economic Geography	(3)
Soc.	42.	Principles of Sociology	(3)
Psych.	1.	Elementary Psychology	(3)

European History. Students looking forward to teaching European history, or taking graduate work leading to the doctorate in this field should select this major. This major is also appropriate for students who are contemplating studying law or entering the diplomatic service.

Required Courses: Elementary

Hist.	25, 26.	European History	(6)
Govt.	3.	Foreign Governments	(3)

Required Courses: Advanced

Hist.	315, 316.	Political and Social History of England	(6)
Hist.	319.	Eighteenth Century European Civilization	(3)
Hist.	320.	Eighteenth Century European Imperialism	(3)

plus nine semester hours to be selected from the following:

Hist.	27, 28.	European Expansion and Empire Building	(6)
Hist.	29, 30.	Modern Europe	(6)
Hist.	331, 332.	Intellectual Expansion of Modern Europe	(6)
Hist.	341, 342.	Expansion of the English-Speaking Peoples	(6)
Govt.	1.	Foundations of Government	(3)

and three semester hours to be selected from the following:

Hist.	317, 318.	The Middle East in World History	(6)
Govt.	363, 364.	Contemporary Political Thought	(6)
Int. Rel.	11, 12.	Diplomacy of Europe	(6)
Int. Rel.	133, 134.	Diplomacy of Russia and the Middle East	(6)
Int. Rel.	341, 342.	International Relations	(6)
Int. Rel.	361, 362.	International Law	(6)

Suggested Electives

Eco.	3, 4.	Economics	(6)
Govt.	51, 52.	American Government (National and State)	(6)
Hist.	329, 330.	American Foreign Policy	(6)
Int. Rel.	332.	Russia in World Affairs	(3)
Soc.	42.	Principles of Sociology	(3)

Government. Students looking forward to teaching civics and political science, or taking graduate work leading to the doctorate in political science should select this major. This major is also appropriate for the students who are contemplating studying law, entering the government service, or engaging in research in the governmental field.

Required Courses: Elementary

Govt.	1.	Foundations of Government	(3)
Govt.	2.	American Political Ideas	(3)

Required Courses: Advanced

Govt.	3.	Foreign Governments	(3)
Govt.	51, 52.	American Government (National and State)	(6)
Govt.	357.	City Government	(3)
Govt.	360.	Public Administration	(3)
Govt.	363, 364.	Contemporary Political Thought	(6)
and six semester hours to be selected from the following:			
Govt.	4.	Political Parties and Electoral Problems	(3)
Govt.	351.	Constitutional Law	(3)
Hist.	13, 14.	United States History	(6)
Hist.	315, 316.	Political and Social History of England	(6)
Hist.	329, 330.	American Foreign Policy	(6)
Hist.	331, 332.	Intellectual Expansion of Modern Europe	(6)
Int. Rel.	341, 342.	International Relations	(6)
Int. Rel.	351, 352.	International Organization	(6)
Int. Rel.	361, 362.	International Law	(6)

Suggested Electives

Fin.	251.	Public Finance: Federal	(3)
Hist.	25, 26.	European History	(6)
Psych.	304.	Social Psychology	(3)
Soc.	42.	Principles of Sociology	(3)
Soc.	262.	Social Problems	(3)

General Major. Students looking forward to teaching the social sciences in the public schools should take this major.

Required Courses: Elementary

Hist.	13, 14.	United States History	(6)
Hist.	25, 26.	European History	(6)
Govt.	1.	Foundations of Government	(3)

Required Courses: Advanced

Hist.	315, 316.	Political and Social History of England	(6)
Govt.	51.	American National Government	(3)
plus six semester hours to be selected from the following:			
Hist.	317, 318.	The Middle East in World History	(6)
Hist.	319, 320.	Eighteenth Century European Civilization and Imperialism	(6)
Hist.	329, 330.	American Foreign Policy	(6)
Hist.	331, 332.	Intellectual Expansion of Modern Europe	(6)
Hist.	341, 342.	Expansion of the English-Speaking Peoples	(6)
Govt.	3.	Foreign Governments	(3)
Govt.	363, 364.	Contemporary Political Thought	(6)
and three semester hours to be selected from the following:			
Hist.	29, 30.	Modern Europe	(6)
Int. Rel.	11, 12.	Diplomacy of Europe	(6)
Int. Rel.	21, 22.	Diplomacy of the Far East	(6)
Int. Rel.	133, 134.	Diplomacy of Russia and the Middle East	(6)
Int. Rel.	351, 352.	International Organization	(6)
Int. Rel.	361, 362.	International Law	(6)

Suggested Electives

Eco.	3, 4.	Economics	(6)
Eco.	50.	Economic Geography	(3)
Int. Rel.	312.	World Affairs since 1919	(3)
Int. Rel.	341, 342.	International Relations	(6)
Soc.	42.	Principles of Sociology	(3)

INTERNATIONAL RELATIONS. This major is designed for men aspiring to the United States Foreign Service, to journalism on the international plane, to commercial employment abroad, or to advanced study in the field, and for those whose intellectual interests lie across national frontiers. Students contemplating a career in the United States Foreign Service are advised to continue language study throughout their course.

Required Courses: Elementary

Int. Rel.	1, 2.	Diplomacy	(6)
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Required Courses: Advanced

Int. Rel.	341, 342.	International Relations	(6)
Int. Rel.	351, 352.	International Organization	(6)
and twelve semester hours to be selected from the following:			
Int. Rel.	11, 12.	Diplomacy of Europe	(6)
Int. Rel.	21, 22.	Diplomacy of the Far East	(6)
Int. Rel.	133, 134.	Diplomacy of Russia and the Middle East	(6)
Int. Rel.	312.	World Affairs since 1919	(3)
Int. Rel.	322.	The Far East in World Affairs	(3)
Int. Rel.	332.	Russia in World Affairs	(3)
Int. Rel.	361, 362.	International Law	(6)
Hist.	317, 318.	The Middle East in World History	(6)
Hist.	329, 330.	American Foreign Policy	(6)
Hist.	349, 350.	Hispanic America in the Nineteenth and Twentieth Centuries	(6)
Govt.	3.	Foreign Governments	(3)
Govt.	51.	American National Government	(3)
Govt.	363, 364.	Contemporary Political Thought	(6)

Suggested Electives

Acctg.	104.	Accounting for Engineers	(3)
Eco.	3, 4.	Economics	(6)
Eco.	50.	Economic Geography	(3)
Eco.	236.	Public Utilities	(3)
E.S.	145.	Statistical Method	(3)
Fin.	125.	Corporation Finance	(3)
Fin.	241, 242.	International Trade and Finance	(6)
Govt.	1.	Foundations of Government	(3)
Hist.	13, 14.	United States History	(6)
Hist.	25, 26.	European History	(6)
Hist.	29, 30.	Modern Europe	(6)
Hist.	327, 328.	Development of American Institutions	(6)
Hist.	332.	Intellectual Expansion of Modern Europe	(3)
Hist.	342.	Expansion of English-Speaking Peoples	(3)
Psych.	4.	Elementary Social Psychology	(3)
Soc.	42.	Principles of Sociology	(3)

MATHEMATICS AND ASTRONOMY. Three majors are offered by the department of mathematics and astronomy: mathematics, mathematics and astronomy, and actuarial science.

Mathematics.

Required Courses: Elementary

Math.	11.	Analytic Geometry and Beginning Calculus	(3)
Math.	12.	Elementary Differential and Integral Calculus	(3)
Math.	13.	Calculus and Solid Analytic Geometry	(3)
Math.	14.	Calculus and Elementary Differential Equations	(3)

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Required Courses: Advanced

Math.	51.	Advanced Algebra	(3)
Math.	54.	Higher Geometry	(3)
Math.	219, 220.	Principles of Analysis	(6)
Math.	315.	Theory of Functions of a Complex Variable	(3)

Six additional hours from the courses in mathematics numbered from 100 to 399.

Mathematics and Astronomy.

Required Courses: Elementary

Astr.	1.	Descriptive Astronomy	(3)
Math.	11.	Analytic Geometry and Beginning Calculus	(3)
Math.	12.	Elementary Differential and Integral Calculus	(3)
Math.	13.	Calculus and Solid Analytic Geometry	(3)
Math.	14.	Calculus and Elementary Differential Equations	(3)

Required Courses: Advanced

Astr.	2.	General Astronomy	(3)
Astr.	103.	Practical Astronomy	(3)
Astr.	104.	Stellar Astronomy and Astrophysics	(3)
Math.	219, 220.	Principles of Analysis	(6)

Three additional hours to be selected from the courses in mathematics numbered from 100 to 399.

Actuarial Science.

Required Courses: Elementary

Math.	11.	Analytic Geometry and Beginning Calculus	(3)
Math.	12.	Elementary Differential and Integral Calculus	(3)
Math.	13.	Calculus and Solid Analytic Geometry	(3)
Math.	14.	Calculus and Elementary Differential Equations	(3)
Math.	40.	Mathematics of Finance	(3)

Required Courses: Advanced

Math.	43.	First Course in Mathematics of Life Insurance	(3)
Math.	51.	Advanced Algebra	(3)
Math.	102.	Finite Differences	(3)
Math.	123.	Probability	(3)
Math.	219.	Principles of Analysis	(3)
Math.	233.	Mathematical Statistics	(3)

Suggested Electives

Acctg.	1,	2.	Accounting	(6)
Eco.	3,	4.	Economics	(6)
Eco.	160.		Insurance	(3)
Eco.	206.		Intermediate Economic Theory	(3)
Fin.	125.		Corporation Finance	(3)
Math.	220.		Principles of Analysis	(3)

PHILOSOPHY.

Required Courses: Elementary

Phil.	1.	Introduction to Philosophy	(3)
Phil.	14.	Logic and Scientific Method	(3)
Phil.	15.	Ethics: The Theory of Conduct	(3)

ARTS AND SCIENCE

Required Courses: Advanced

Phil.	231.	Ancient and Medieval Philosophy	(3)
Phil.	232.	Modern Philosophy	(3)

and fifteen additional hours, at least nine of which shall be chosen from the courses listed below. The other six may be taken from appropriate advanced courses in other fields as approved by the head of the department of philosophy.

Phil.	151.	Esthetics	(3)
Phil.	171, 172.	Readings in Philosophy	(6)
Phil.	181.	The Organization of Knowledge	(3)
Phil.	191, 192.	Proseminar in Metaphysics	(6)
Phil.	237.	Nineteenth Century Philosophy	(3)
Phil.	238.	Twentieth Century Philosophy	(3)
Phil.	239.	American Philosophy	(3)
Phil.	261.	Philosophy of Science	(3)
Math.	303.	Mathematical Logic	(3)

PHYSICS.

Required Courses: Elementary

Phys.	12.	Introduction to Physics	(3)	}.....(8)
Phys.	16.	General Physics	(3)	
Phys.	17.	General Physics Laboratory	(2)	
or				
Phys.	22.	Mechanics and Properties of Matter	(4)	}.....(12)
Phys.	23.	Heat, Sound, and Light	(4)	
Phys.	24.	Electricity and Magnetism	(4)	

Required Courses: Advanced

Phys.	110, 111.	Electrical Laboratory	(2)
Phys.	191.	Laboratory Techniques	(1)
Phys.	192, 193.	Advanced Physics Laboratory	(2)
Phys.	212, 213.	Introductory Theory of Electricity and Magnetism	(6)
Phys.	252.	Geometrical and Physical Optics	(4)
Phys.	268, 269.	Introduction to Modern Physical Theories	(6)
Phys.	314.	Physics of Electronics	(4)
Phys.	340.	Heat and Pyrometry	(4)

Required Courses: Collateral

Math.	11.	Analytic Geometry and Beginning Calculus	(3)
Math.	12.	Elementary Differential and Integral Calculus	(3)
Math.	13.	Calculus and Solid Analytic Geometry	(3)
Math.	14.	Calculus and Elementary Differential Equations	(3)
Math.	206.	Advanced Calculus	(3)
Mech.	3.	Statics and Dynamics	(3)

PSYCHOLOGY. Five types of specialization are offered by the department of psychology: general, industrial, preclinical, pre-medical, and social science. For the majority of majors in this field it is recommended that the first two years be spent dominantly in securing a foundation in physical sciences.

General Psychology: for majors intending to go into graduate schools emphasizing research, experimental work, and teaching.

Required Courses

FRESHMAN YEAR

Chem.	4, 5.	General Chemistry	(8)
Biol.	31, 32.	Zoology	(6)

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SOPHOMORE YEAR

Biol.	18.	Genetics	(2)
Phys.	12.	Introduction to Physics	(3)
Phys.	16.	General Physics	(3)
Psych.	1.	Elementary Psychology	(3)
Psych.	4.	Elementary Social Psychology	(3)

JUNIOR YEAR

Psych.	329.	Physiological Psychology	(3)
Psych.	335, 336.	Experimental Psychology	(6)
Psych.	352.	Industrial Selection and Classification	(3)

SENIOR YEAR

Psych.	302.	Psychological Tests and Measurements	(3)
Psych.	308.	Child Psychology	(3)
Psych.	309.	Abnormal Psychology	(3)
Psych.	320.	History of Psychology	(3)

Suggested Electives

Biol.	3.	Comparative Vertebrate Anatomy	(3)
Biol.	4.	Vertebrate Embryology	(3)
Math.	42.	Introduction to Mathematics of Statistics	(3)
Math.	233.	Mathematical Statistics	(3)
Phil.	14.	Logic and Scientific Method	(3)
Phys.	17.	General Physics Laboratory	(2)
Psych.	317.	Personality	(3)

Industrial Psychology: for majors intending to specialize in employment testing, labor relations, and production floor psychology (industrial personnel).

Required Courses

FRESHMAN YEAR

Chem.	4, 5.	General Chemistry	(8)
Biol.	13.	Human Biology	(3)
or			
Biol.	31, 32.	Zoology	(6)

SOPHOMORE YEAR

Phys.	12.	Introduction to Physics	(3)
Eco.	3, 4.	Economics	(6)
I.E.	13.	Elementary Industrial Engineering	(3)
Psych.	1.	Elementary Psychology	(3)

JUNIOR YEAR

Psych.	329.	Physiological Psychology	(3)
Psych.	335, 336.	Experimental Psychology	(6)
Psych.	352.	Industrial Selection and Classification	(3)
Eco.	233, 234.	Labor Problems	(6)
I.E.	114.	Plant Administration	(3)
I.E.	115.	Personnel Administration	(3)

SENIOR YEAR

Psych.	302.	Psychological Tests and Measurements	(3)
Psych.	304.	Social Psychology	(3)
Psych.	309.	Abnormal Psychology	(3)
Psych.	351.	Industrial Training and Work Control	(3)
Psych.	354.	Psychology of Design Factors	(3)
I.E.	328.	Work Simplification	(3)

Suggested Electives

Math.	42.	Introduction to Mathematics of Statistics	(3)
Math.	233.	Mathematical Statistics	(3)
Phil.	14.	Logic and Scientific Method	(3)

Preclinical Psychology: for majors intending to go into graduate work in clinical psychology, or who wish to secure the Pennsylvania certificate for Public School Examiner after one year of graduate instruction and the internship.

Required Courses

FRESHMAN YEAR

Chem.	4,	5.	General Chemistry	(8)
Biol.	31,	32.	Zoology	(6)

SOPHOMORE YEAR

Phys.	12.	Introduction to Physics	(3)
Psych.	1.	Elementary Psychology	(3)
Psych.	4.	Elementary Social Psychology	(3)
Educ.	20.	Educational Psychology	(3)

JUNIOR YEAR

Psych.	309.	Abnormal Psychology	(3)
Psych.	317.	Personality	(3)
Psych.	329.	Physiological Psychology	(3)
Psych.	335, 336.	Experimental Psychology	(6)
Psych.	352.	Industrial Selection and Classification	(3)

SENIOR YEAR

Psych.	302.	Psychological Tests and Measurements	(3)
Psych.	308.	Child Psychology	(3)
Psych.	315.	Projective Techniques	(3)
Psych.	316.	Individual Testing Practice	(3)
Psych.	320.	History of Psychology	(3)

Suggested Courses

Educ.	321.	Diagnosis and Adjustment of Reading Difficulties	(3)
Educ.	375.	Diagnostic and Remedial Teaching	(3)
Math.	42.	Introduction to Mathematics of Statistics	(3)
Math.	233.	Mathematical Statistics	(3)
Psych.	313, 314.	Field Practice in Applied Psychology	(6)

Premedical Psychology: for majors intending to enter medical school, and having a primary interest in training for the field of psychiatry.

Required Courses

FRESHMAN YEAR

Chem.	4,	5.	General Chemistry	(8)
Biol.	31,	32.	Zoology	(6)

SOPHOMORE YEAR

Phys.	12.	Introduction to Physics	(3)
Phys.	16, 17.	General Physics and Laboratory	(5)
Chem.	35.	Analytical Chemistry	(4)
Psych.	1.	Elementary Psychology	(3)
Psych.	4.	Elementary Social Psychology	(3)

JUNIOR YEAR

Psych.	309.	Abnormal Psychology	(3)
Psych.	329.	Physiological Psychology	(3)
Psych.	335, 336.	Experimental Psychology	(6)
Psych.	352.	Industrial Selection and Classification	(3)
Biol.	3.	Comparative Vertebrate Anatomy	(3)
Biol.	4.	Vertebrate Embryology	(3)

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SENIOR YEAR

Psych.	302.	Psychological Tests and Measurements	(3)
Psych.	315.	Projective Techniques	(3)
Chem.	150, 151.	Organic Chemistry	(6)
Chem.	165.	Organic Chemistry Laboratory	(2)
Biol.	18.	Genetics	(2)

Suggested Electives

Biol.	61.	Bacteriology	(3)
Math.	42.	Introduction to Mathematics of Statistics	(3)
Phil.	14.	Logic and Scientific Method	(3)
Psych.	316.	Individual Testing Practice	(3)

Social Science Psychology: for students expecting to locate with government agencies, welfare activities, and public service.

Required Courses

FRESHMAN YEAR

Phys.	12.	Introduction to Physics	(3)
Chem.	15.	Elementary Chemistry	(3)
(if entrance credentials include physics and chemistry, the above may be omitted)			
Biol.	13.	Human Biology	(3)
		and two courses in history or government	(6)

SOPHOMORE YEAR

Psych.	1.	Elementary Psychology	(3)
Psych.	4.	Elementary Social Psychology	(3)
Eco.	3, 4.	Economics	(6)
Soc.	42.	Principles of Sociology	(3)
Soc.	44.	American Community	(3)

JUNIOR YEAR

Psych.	308.	Child Psychology	(3)
Psych.	329.	Physiological Psychology	(3)
Psych.	335, 336.	Experimental Psychology	(6)
Eco.	233, 234.	Labor Problems	(6)

SENIOR YEAR

Psych.	309.	Abnormal Psychology	(3)
Psych.	317.	Personality	(3)
Psych.	320.	History of Psychology	(3)

Suggested Electives

Int. Rel.	341, 342.	International Relations	(6)
Phil.	14.	Logic and Scientific Method	(3)
Soc.	41.	Cultural Anthropology	(3)

ROMANCE LANGUAGES. Majors are offered in French and Spanish.

French.

Required Courses: Elementary

Fr.	1,	2.	Elementary French	(6)
Fr.	11,	12.	Intermediate French	(6)
Fr.	13,	14.	Types of French Literature	(6)

Required Courses: Advanced

Fr.	21,	22.	Seventeenth and Eighteenth Centuries French Literature	(6)
	or			
Fr.	31,	32.	Nineteenth Century French Literature	(6)
Fr.	221.		French Literature before the Seventeenth Century	(3)
Fr.	222.		Contemporary French Literature	(3)
Fr.	223,	224.	Proseminar	(6)

Suggested Electives

Engl.	323,	324.	Shakespeare and the Elizabethan Drama	(6)
Hist.	331,	332.	Intellectual Expansion of Modern Europe	(6)
Gk.	200.		Greek Literature in English Translation	(3)
Lat.	201.		Latin Literature in English Translation	(3)

The student will be expected to complete supplementary reading, the list of which he will receive at the beginning of his major work, and to correlate the knowledge gained in courses and readings through the use of some recommended history of French literature.

Spanish.

Required Courses: Elementary

Span.	1,	2.	Elementary Spanish	(6)
Span.	11,	12.	Intermediate Spanish	(6)
Span.	21.		Introduction to Modern Spanish Fiction	(3)
Span.	22.		Introduction to Modern Spanish Drama	(3)

Required Courses: Advanced

Span.	221.		Spanish Fiction of the Golden Age	(3)
Span.	222.		Spanish Drama of the Golden Age	(3)
Span.	223,	224.	Proseminar	(6)
Span.	231,	232.	Spanish-American Literature	(6)

Suggested Electives

Engl.	323,	324.	Shakespeare and the Elizabethan Drama	(6)
Hist.	331,	332.	Intellectual Expansion of Modern Europe	(6)
Hist.	349,	350.	Hispanic America in the Nineteenth and Twentieth Centuries	(6)
Gk.	200.		Greek Literature in English Translation	(3)
Lat.	201.		Latin Literature in English Translation	(3)

In addition to the outside reading and reports required in connection with these courses, the student will be expected to acquire a knowledge of the history of Spanish literature as a whole.

SOCIOLOGY. A major in sociology is designed to provide pre-professional preparation for graduate work in law, social work, social research, the ministry, institutional work, personnel work, teaching, interracial and intercultural work, and civil service appointments with local, state, and federal governmental agencies.

LEHIGH UNIVERSITY

Required Courses: Elementary

Soc.	41.	Cultural Anthropology	(3)
Soc.	42.	Principles of Sociology	(3)
Eco.	3,	4. Economics	(6)

Required Courses: Advanced

Soc.	44.	The American Community	(3)
Soc.	262.	Social Problems	(3)
Soc.	263.	Community Organization for Social Services	(3)
Soc.	264.	The Family	(3)
Soc.	266.	Population Problems	(3)
Psych.	4.	Elementary Social Psychology	(3)
E.S.	145.	Statistical Method	(3)

Suggested Electives

Soc.	271,	272.	Readings in Sociology	(6)
Biol.	13,		Human Biology	(3)
or				
Biol.	33,	34.	Biology and Organic Evolution	(6)
Educ.	1.		Introduction to Education	(3)
Govt.	357.		City Government	(3)
Eco.	233 or	234.	Labor Problems	(3)
Psych.	1.		Elementary Psychology	(3)
Psych.	304.		Social Psychology	(3)
Hist.	327,	328.	Development of American Institutions	(6)

**The College of
Business Administration**

The College of Business Administration

Administrative Officers

Martin Dewey Whitaker, *President*

Earl Kenneth Smiley, *Vice-President*

Carl Elmer Allen, *Dean of the College of Business
Administration*

Wray Hollowell Congdon, *Dean of Students*

Clarence Bowen Campbell, *Acting Director of
Admissions*

James Harold Wagner, *Acting Registrar*

The College of Business Administration, which is a member of the American Association of Collegiate Schools of Business, offers a program of study designed to provide thorough and systematic training in the fundamentals of business. More specifically, the College aims to develop in the student an intelligent understanding of business principles, an ability to analyze industrial facts, and habits of thought which will enable him to cope with the problems that increasing executive responsibilities will bring him in later life. Stress is on the building of a sound foundation, since it is the firm belief of the College that no substitute can be furnished for the training and experience provided by actual contact with the complex problems of modern business. Accordingly, the student's interests are best served by equipping him with those fundamental facts and insights which will make it possible for him to profit more readily from practical experience after graduation.

In accordance with this plan of training in fundamentals, the student is required to learn the basic principles that underlie all business. No student is permitted to omit basic work in the principles and problems of economics, economic history, accounting, corporation finance, money and banking, marketing, business law, labor problems, and statistical method, which are essential for a career in all types of business enterprise. This insistence upon an acquaintance with the fundamentals of the broad field not only equips the student with the elementary requisites for a career in a variety of commercial and industrial enterprises but also gives him an invaluable means of discovering his real abilities and making a sound choice of a profession. A major function of the curriculum in business administration is to aid students in their efforts to discover their best talents, not only those individuals who enter college uncertain of their ultimate objectives but also those whose choice of a future profession or field of business may have been determined already but predicated upon inadequate grounds.

In addition to this principle of a generalized training in business fundamentals, the College regards as important the principle that the training as a whole shall offer an education commensurate with the standards of a university. The curriculum permits no student to devote himself exclusively to business subjects. He must acquire at least a rudimentary acquaintance with the cultural and humanitarian aspects of the world around him, and at least a brief contact with science. Consequently, a large part of the curriculum is devoted to work in liberal and scientific subjects. In the freshman year, only one course each semester is taken in the College of Business Administration. In the sophomore year, the curriculum offers only two courses each semester in business administration. Throughout the entire four years work there is emphasis on the social aspects of the subjects considered. If a student develops alongside his business work a special interest in some such field as languages, mathematics, or science, he is given opportunity, through electives, to pursue his special line.

In view of the breadth of training afforded by the variety of required and elective courses, satisfactory preparation for careers in fields other than commerce and industry is also available to students in the College of Business Administration. This is par-

ticularly true of law, for which business curricula of the better type are now recognized as excellent preliminary training. Lehigh University has been included by the leading law schools of the country among the institutions whose business curricula meet their admissions requirements.

Perhaps the most distinctive feature of the work in business administration at Lehigh is the character of the class work. Much of the work of the curriculum is taken in the College of Engineering and the College of Arts and Science, while students of these two divisions in very large numbers avail themselves of the courses given in the College of Business Administration. There is no segregation of students by colleges, and students in business administration take their courses in competition with students trained in liberal arts and in the exact sciences. This condition has a marked influence on the standards of work and the quality of the student.

Although emphasis is upon broad training, rather than specialization, the College recognizes that some degree of concentration is desirable after the student's interests may reasonably be expected to have crystallized. Accordingly, in the junior and senior years, every student is required to pursue a series of related courses in some more restricted field. Six fields of concentration are offered, viz.: accounting, economics, economic statistics, finance, marketing, and general business. The detailed programs of study in each of the above fields are set forth on the following pages.

In times of normal business activity, students who have made creditable records may reasonably expect to receive one or more offers of positions before the date of their graduation. The College of Business Administration enjoys happy relations with many of the country's leading industries. Representatives regularly visit the campus to engage the services of students graduating in business administration. The University assumes no responsibility for finding positions for its graduates, but every effort is made by the College and by the university placement service to put its graduating students in touch with desirable opportunities for employment.

Graduates of this curriculum receive the degree of Bachelor of Science in Business Administration.

THE CURRICULUM IN BUSINESS ADMINISTRATION

Total hours required for degree of B.S. in Business Administration: 128

I. Required Courses (59 hours)

<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>
Acctg. 1	Accounting	3	Law 101	Business Law	3
Acctg. 2	Accounting	3	Math. 1b	Gen. Math. for Bus.	3
Eco. 1	Ind. Evolution	3	Math. 40	Math. of Finance	3
Eco. 3	Economics	3	M.S. A.S. 1	Mil./Air Science	2
Eco. 4	Economics	3	M.S. A.S. 2	Mil./Air Science	2
Eco. 111	Marketing	3	M.S. A.S.	Mil./Air Science	2
Eco. 50	Economic Geography ..	3	M.S. A.S.	Mil./Air Science	2
Eco. 233	Labor Problems	3	Biol. 15	Freshman Hygiene	—
Engl. 1	Composition & Lit.	3	P.E. 1	Physical Education	—
or Engl. 11	Types of World Lit. ...	3	P.E. 2	Physical Education	—
Engl. 2	Composition & Lit.	3	P.E. 3	Physical Education	—
or Engl. 12	Types of World Lit. ...	3	P.E. 4	Physical Education	—
E.S. 145	Statistical Method	3	P.E. 5	Physical Education	—
E.S. 246	Business Cycles	3	P.E. 6	Physical Education	—
Fin. 125	Corporation Finance	3	P.E. 7	Physical Education	—
Fin. *	Money & Banking	3	P.E. 8	Physical Education	—

*Students majoring in accounting, marketing, or general business will take Fin. 133. Money and Banking. Students majoring in economics, economic statistics, or finance will take Fin. 129, Money and Banking.

II. Major Program (24 hours)

Before the end of the second semester of their sophomore year students will select a major or field of concentration. A major program will consist of twenty-four hours of sequential or related courses prescribed by the dean of the College and the head of the department concerned.

III. Optional Courses (33 hours)

ENGLISH OR FOREIGN LANGUAGE OPTION (12 HOURS)

Students who present two units in one foreign language for entrance credit will not be required to take further work in foreign languages. Students who present less than two units of a foreign language for entrance credit will be required to take six hours in one foreign language. Credit for less than six hours in an elementary language will not be accepted in partial satisfaction of this requirement.

All courses offered by the Department of English which require work in composition, either oral or written, or a study of literature will be accepted in satisfaction of this English-Foreign Language requirement. Journalism courses which do not require work in composition or study of literature will not be accepted.

OTHER ARTS OPTIONS (12 HOURS)

The Arts Options requirement may be met by taking a total of twelve hours work in the following fields, not more than six hours to be in any one of the fields designated: astronomy, education, fine arts, government, history, international relations, mathematics, music, philosophy, psychology, religion, sociology.

SCIENCE OPTION (9 HOURS)

Not more than six hours in the Science Option may be taken in one department. The following courses are acceptable in satisfaction of the science requirement: Biol. 1, 6, 13, or 33 and 34; Geol. 1, or 3 and 4; Chem. 15 and 16; Phys. 12 and 16.

IV. Electives (12 hours)

Any courses in the University for which a student has the prerequisites may be used to meet this requirement.

COURSES OF STUDY

FIRST SEMESTER			FRESHMAN YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 1	Ind. Evolution	3	Eco. 50	Economic Geography	3			
	*English	3		*English	3			
Math. 1b	Gen. Math. for Bus.	3	Math. 40	Math. of Finance	3			
	Foreign Language }	3		Foreign Language }	3			
	or Arts Option }	3		or Arts Option }	3			
M.S. A.S. 1	Science	3		Science	3			
P.E. 1	Mil./Air Science	2	M.S. A.S. 2	Mil./Air Science	2			
	Physical Education	—	P.E. 2	Physical Education	—			
		17			17			

*For a statement of the freshman English requirement see "Freshman Composition" under the heading "English" in the section "Description of Courses."

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Acctg. 1	Accounting	3	Acctg. 2	Accounting	3			
Eco. 3	Economics	3	Eco. 4	Economics	3			
	Engl. or For. Lang. }	6		Engl. or For. Lang. }	9			
	& Arts Options.....	3		& Arts Options.....	2			
M.S. A.S.	Science	3	M.S. A.S.	Mil./Air Science	2			
P.E. 3	Mil./Air Science	2	P.E. 4	Physical Education	—			
	Physical Education	—			—			
		17			17			

Courses Required of All Students

FIRST SEMESTER			JUNIOR AND SENIOR YEARS			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
E.S. 145	Stat. Method	3	E.S. 246	Bus. Cycles	3			
Eco. 111	Marketing	3	Eco. 233	Labor Problems	3			
Fin. *	Money & Banking	3	Fin. 125	Corp. Finance	3			
Law 101	Business Law	3		Engl. or For. Lang. }	3			
	Free Electives	6		or Arts Option**	—			
				Free Electives	6			

NOTE: Eco. 111, Eco. 233, Fin. 133, and Fin. 125 are offered both semesters.

*Finance 129 is required of all students majoring in economics, finance, or economic statistics (see exceptions under this major). Finance 133 is required of all students majoring in accounting, marketing, or general business.

** Normally, a student will not have completed all the options in English or Foreign Language or Arts and will be required to roster a course in one of these fields during the junior or senior years.

Major in Accounting

FIRST SEMESTER		JUNIOR AND SENIOR YEARS				SECOND SEMESTER	
Required Courses in Major*							
Acctg.	213	Intermed. Acctg.	3	Acctg.	214	Intermed. Acctg.	3
Acctg.	115	Cost Acctg.	3	Acctg.	218	Adv. Cost Acctg.	3
Acctg.	219	Spec. Acctg. Systems....	3	Acctg.	220	Auditing	3
Law	103	Fed. Tax Law	3	Law	102	Business Law	3
Suggested Electives*							
I.E.	102	Ind. Mngmt.	3	I.E.	103	Ind. Mngmt.	3
Fin.	223	Investments	3	Eco.	206	Inter. Eco. Theory ...	3
Fin.	153	Credits & Col.	3	E.S.	252	Adv. Stat. Method ...	3

Major in Economics

FIRST SEMESTER		JUNIOR AND SENIOR YEARS				SECOND SEMESTER	
Required Courses in Major							
Eco.	207	Adv. Econ.	 3	Eco.	234	Labor Problems	 3
Fin.	251	Pub. Fin.: Federal	 3	Fin.	130	Money & Banking	 3
Eco.	206	Inter. Eco. Theory	 3				
and nine semester hours to be selected from the following in consultation with the adviser:							
E.S.	247	Nat. Inc. Analysis	 3	E.S.	248	Adv. Bus. Cycles	 3
Fin.	241	Inter. Trade & Fin.	 3	Fin.	242	Int. Trade & Fin.	 3
Eco.	235	Transportation	 3	Fin.	254	Fiscal Policy	 3
Eco.	271	Readings in Eco.	 3	Eco.	208	Adv. Econ.	 3
				Eco.	236	Pub. Utilities	 3
				Eco.	272	Readings in Eco.	 3
Suggested Electives							
Acctg.	213	Intermed. Acctg.	 3	Phil.	14	Logic & Scient. Meth.	3
Math.	11	Anal. Geom. & Calc.	3	Math.	12	El. Diff. & Int. Calc.	3
Hist.	327	Dev. Amer. Inst.	 3	Hist.	328	Dev. Amer. Inst.	 3
Hist.	331	Intel. Expan. Eur.	 3	Hist.	332	Intel. Expan. Eur.	 3

Major in Economic Statistics

FIRST SEMESTER		JUNIOR AND SENIOR YEARS				SECOND SEMESTER	
Required Courses in Major							
E.S.	247	Natl. Inc. Analy.	 3	†Fin.	130	Money & Banking	 3
Eco.	206	Inter. Eco. Theory	 3	E.S.	248	Adv. Bus. Cycles	 3
				E.S.	252	Adv. Stat. Method	 3
and nine semester hours to be selected from the following in consultation with the adviser:							
Fin.	223	Investments	 3	Fin.	224	Investments	 3
Fin.	251	Pub. Finance; Fed.	 3	Fin.	232	Mon. & Cred. Policies	3
Eco.	271	Readings in Eco.	 3	Fin.	254	Fiscal Policy	 3

* The New York State Board of Certified Public Accountant Examiners requires 8 credit hours of finance for candidates for the C. P. A. examinations in that state. The New Jersey State Board of Public Accountants also requires 8 hours of finance and also 30 hours of accounting for candidates for the C. P. A. Examination in that state. It is, therefore, recommended that students who anticipate becoming candidates for the C. P. A. examinations in either of those states take 9 credit hours of finance courses and students who anticipate becoming candidates for the C. P. A. examinations in New Jersey also take Acctg. 271 and Acctg. 272, Readings in Accounting, as a part of their elective program.

† Students whose primary interest is actuarial science will take Finance 133 instead of Finance 129 and 130, and will be required to select twelve semester hours instead of nine from the above group.

BUSINESS ADMINISTRATION

Math.	13	Calc. & Sol.	Eco.	214	Sell. & Sales Mgmt.	3
		Anal. Geom.	Math.	14	Calc. & El. Diff. Eq.	3
Math.	43	Math. of Life Ins.	Math.	324	Theory of Errors	3
Math.	123	Probability	I.E.	114	Ind. Admin.	3
I.E.	13	Elem. Ind. Engrg.	I.E.	326	Quality Control	3
I.E.	325	Prod. Control				

Suggested Electives

Math.	11	Anal. Geom. & Cal.	Math.	12	El. Diff. & Int. Calc.	3
Hist.	327	Dev. Amer. Inst.	Math.	340	Higher Algebra	3
E.S.	271	Readings in Eco. Stat.	Hist.	328	Dev. Amer. Inst.	3
			E.S.	272	Readings in Eco. Stat.	3

Major in Finance

FIRST SEMESTER JUNIOR AND SENIOR YEARS SECOND SEMESTER

Required Courses in Major

Fin.	223	Investments	3	Fin.	126	Corp. Finance	3
Fin.	251	Pub. Finance: Fed.	3	Fin.	130	Money & Banking	3
				Eco.	206	Inter. Eco. Theory	3

and nine semester hours to be selected from the following in consultation with the adviser:

Fin.	153	Credits & Collect	3	Fin.	224	Investments	3
Fin.	231	Bank Credit Prob.	3	Fin.	232	Mon. & Cr. Policies	3
Fin.	241	Inter. Trade & Fin.	3	Fin.	242	Inter. Trade & Fin.	3
E.S.	247	Nat'l. Inc. Anal.	3	Fin.	252	Pub. Finance:	
						State & Local	3
				Fin.	254	Fiscal Policy	3
				E.S.	248	Adv. Bus. Cycles	3
				Eco.	160	Insurance	3

Suggested Electives

Acctg.	213	Intermed. Acctg.	3	Acctg.	214	Intermed. Acctg.	3
Eco.	207	Adv. Econ.	3	Eco.	208	Adv. Economics	3
Fin.	271	Readings in Fin.	3	Fin.	272	Readings in Fin.	3

Major in Marketing

Required Courses in Major

FIRST SEMESTER SECOND SEMESTER

Eco.	113	Advertising	3	Eco.	115	Retailing	3
Eco.	235	Transportation	3	Eco.	206	Intermed. Eco. Theory	3
Fin.	241	Inter. Trade & Fin.	3	Eco.	214	Sell. & Sales Mgmt.	3

and six semester hours to be selected from the following in consultation with the adviser:

I.E.	102	Ind. Mgmt.	3	I.E.	103	Ind. Mgmt.	3
Soc.	42	Prin. of Soc.	3	Psych.	16	Psych. of Business	3
Fin.	153	Credits & Col.	3	Fin.	242	Int. Trade & Fin.	3
Acctg.	115	Cost Acctg.	3	Eco.	160	Insurance	3
E.S.	247	Nat'l. Inc. Anal.	3	Eco.	272	Readings in Eco.	3
Eco.	271	Readings in Eco.	3				

Suggested Electives

Engl.	41	Business Letters	3	Speech	31	Bus. & Prof. Speaking.	3
Journ.	43	Writing for Bus.	3				

Major in General Business

FIRST SEMESTER		JUNIOR AND SENIOR YEARS				SECOND SEMESTER	
Required Courses in Major							
Acctg.	213	Intermed. Acctg. or		*Eco.	113	Advertising or	
Acctg.	115	Cost Accounting	3	Eco.	214	Sell. & Sales Mgmt. ..	3
Eco.	206	Intermed. Eco. Theory ..	3	Fin.	126	Corp. Finance	3
Fin.	251	Pub. Fin.: Federal	3	Law	102	Bus. Law	3
and six semester hours to be selected from the following in consultation with the adviser:							
Acctg.	213	Intermed. Acctg. or		Eco.	160	Insurance	3
Acctg.	115	Cost Accounting	3	Eco.	208	Adv. Eco.	3
E.S.	247	Nat'l. Income Analy.	3	Eco.	236	Pub. Utilities	3
Fin.	153	Credit & Col.	3	E.S.	248	Adv. Bus. Cycles	3
Fin.	223	Investments	3	E.S.	252	Adv. Stat. Meth.	3
Fin.	241	Int. Trade & Fin.	3	Fin.	232	Mon. & Cr. Policies ..	3
Law	103	Fed. Tax Law	3	Fin.	252	Pub. Finance:	
Eco.	113	Advertising or				State & Local	3
*Eco.	214	Sell. & Sales Mgmt. ..	3	Fin.	254	Fiscal Policy	3
Suggested Electives							
Eco.	235	Transportation	3	Eco.	234	Labor Problems	3
I.E.	102	Ind. Mgmt.	3	Soc.	262	Social Problems	3
Soc.	42	Prin. of Soc.	3	I.E.	103	Ind. Mgmt.	3
				I.E.	115	Personnel Adm.	3

FIVE YEAR CURRICULUM IN INDUSTRIAL
ENGINEERING AND BUSINESS ADMINISTRATION

Students who desire to pursue both industrial engineering and business administration may complete the required work for the degree of Bachelor of Science in Industrial Engineering by the end of the fourth year and that required for the degree of Bachelor of Science in Business Administration by the end of the fifth year. It is necessary that a student be enrolled in the curriculum in industrial engineering for the first four years and that he complete the requirements in this curriculum as outlined on pages 104 and 105. At the beginning of the fifth year the student transfers to the curriculum in business administration and is required to complete thirty semester hours in one of the following majors:

Major in Accounting

FIRST SEMESTER		FIFTH YEAR		SECOND SEMESTER			
Required Courses							
Law	102	Business Law	3	Law	102	Business Law	3
Fin.	133	Money & Banking	3	Acctg.	214	Intermed. Acctg.	3
Law	103	Federal Tax Law	3	Acctg.	218	Adv. Cost Acctg.	3
Acctg.	213	Intermed. Acctg.	3	Acctg.	220	Auditing	3
Acctg.	219	Sp. Acctg. Systems	3	Acctg.	272	Readings in Acctg.	3

* Eco. 214, Sell. & Sales Mgmt. offered second semester only.

Major in Economics

FIRST SEMESTER		FIFTH YEAR		SECOND SEMESTER		
Required Courses						
Law	101	Business Law	3	Eco.	206 Inter. Eco. Theory	3
Fin.	133	Money & Banking	3	Eco.	208 Adv. Economics	3
Eco.	207	Adv. Economics	3			
Fin.	251	Pub. Fin.; Federal	3			
and twelve semester hours to be selected from the following in consultation with the adviser:						
Eco.	235	Transportation	3	Eco.	236 Public Utilities	3
Fin.	241	Inter. Trade & Fin.	3	Eco.	234 Labor Problems	3
E.S.	247	Nat. Income Anal.	3	Fin.	242 Inter. Trade & Fin. ..	3
Soc.	42	Sociology	3	Fin.	254 Fiscal Policy	3
Eco.	271	Readings in Eco.	3	E.S.	248 Adv. Bus. Cycles	3
				E.S.	252 Adv. Stat. Meth.	3
				Soc.	262 Social Problems	3
				Eco.	272 Readings in Eco.	3

Major in Economic Statistics

FIRST SEMESTER		FIFTH YEAR				SECOND SEMESTER	
<i>Required Courses</i>							
Law	102	Business Law	3	Eco.	206	Inter. Eco. Theory	3
Fin.	133	Money & Banking	3	E.S.	248	Adv. Bus. Cycles	3
E.S.	247	Nat. Income Anal.	3	E.S.	252	Adv. Stat. Meth.	3
and twelve semester hours to be selected from the following in consultation with the adviser:							
Fin.	223	Investments	3	Fin.	224	Investments	3
Fin.	251	Pub. Fin.; Federal	3	Fin.	254	Fiscal Policy	3
Eco.	214	Sell. & Sales Mgmt. ..	3	Fin.	232	Mon. & Cr. Policies ..	3
Math.	123	Probability	3	Math.	324	Theory of Errors	3
E.S.	271	Read. in Eco. Stat	3	E.S.	272	Read. in Eco. Stat. ..	3

Major in Finance

FIRST SEMESTER		FIFTH YEAR		SECOND SEMESTER		
Required Courses						
Law	102	Business Law	3	Fin.	126 Prob. in Corp. Fin... 3	
Fin.	133	Money & Banking	3	Eco.	206 Inter. Eco. Theory 3	
Fin.	223	Investments	3			
Fin.	251	Pub. Fin.; Federal ..	3			
and twelve semester hours to be selected from the following in consultation with the adviser:						
Fin.	153	Credits & Col.	3	Eco.	160 Insurance	3
Fin.	241	Inter. Trade & Fin. ..	3	Fin.	242 Inter. Trade & Fin. ..	3
Eco.	235	Transportation	3	Fin.	224 Investments	3
Acctg.	213	Intermed. Acctg.	3	Fin.	232 Mon. & Cr. Pol.	3
Fin.	271	Readings in Fin.	3	Fin.	252 Public Finance; State & Local	3
				Fin.	254 Fiscal Policy	3
				Eco.	236 Public Utilities	3
				Acctg.	214 Intermed. Acctg.	3
				Fin.	272 Readings in Fin.	3

Major in Marketing

FIRST SEMESTER			FIFTH YEAR		SECOND SEMESTER		
<i>Required Courses</i>							
Law	101	Business Law	3	Eco.	115	Retailing	3
Fin.	133	Money & Banking	3	Eco.	206	Inter. Eco. Theory	3
Eco.	113	Advertising	3	Eco.	214	Sell. & Sales Mgmt.	3
and twelve semester hours to be selected from the following in consultation with the adviser:							
Fin.	153	Credits & Col.	3	Eco.	160	Insurance	3
Fin.	241	Inter. Trade & Fin....	3	Fin.	242	Inter. Trade & Fin.	3
Eco.	235	Transportation	3	Acctg.	218	Adv. Cost Acctg.	3
Soc.	42	Sociology	3	Eco.	272	Readings in Eco.	3
Eco.	271	Readings in Eco.	3				

Major in Personnel and Industrial Relations

FIRST SEMESTER			FIFTH YEAR			SECOND SEMESTER		
<i>Required Courses</i>								
Law	101	Business Law	3	Eco.	206	Inter. Eco. Theory	3	
Fin.	133	Money & Banking	3	Eco.	234	Labor Problems	3	
Psych.	351	In. Tr. & Work Control	3					
Soc.	42	Sociology	3					
and twelve semester hours to be selected from the following in consultation with the adviser:								
Fin.	223	Investments	3	Law	102	Business Law	3	
Fin.	251	Pub. Fin.; Federal ..	3	Eco.	160	Insurance	3	
Fin.	241	Inter. Trade & Fin...	3	E.S.	252	Adv. Statis. Meth. ..	3	
E.S.	247	Nat. Income Anal.	3	Psych.	352	Ind. Select. & Class..	3	
Eco.	271	Readings in Eco.	3	Govt.	360	Pub. Adm.	3	
				Soc.	262	Social Problems	3	
				Eco.	272	Readings in Eco.	3	

The College of
Engineering

The College of Engineering

Administrative Officers

Martin Dewey Whitaker, *President*

Earl Kenneth Smiley, *Vice-President*

Harvey Alexander Neville, *Chairman of the Executive Committee*

Wray Hollowell Congdon, *Dean of Students*

John Douglas Leith, *Associate Dean of Students*

Clarence Bowen Campbell, *Acting Director of Admissions*

James Harold Wagner, *Acting Registrar*

The College of Engineering offers curricula in chemical engineering, chemistry, civil engineering, electrical engineering, engineering physics, industrial engineering, mechanical engineering, metallurgical engineering, and mining engineering. Five-year courses combining the liberal arts and engineering, business administration and industrial engineering, electrical and mechanical engineering, electrical engineering and physics are also provided. In each of these combined curricula one baccalaureate degree is awarded upon the successful completion of four years of study, and a second baccalaureate degree is awarded at the end of the fifth year.

The engineering curricula were formulated on the basis of an intense study, by the faculty of Lehigh University, of the problems of technical education and the changing needs of modern industry. This study led to the conclusion that greater emphasis than heretofore should be placed upon the fundamentals of engineering, including mathematics, physics, chemistry, and theoretical and applied mechanics, and less emphasis upon the highly specialized details of engineering practice; and that the engineer must

know something of the social sciences, that is, the sciences which deal with human relations, and be familiar with the methods of business organization and administration. The various engineering curricula accordingly emphasize the fundamental sciences and those humanistic subjects which are a part of the equipment of every well educated man and which are now recognized as essential to the proper training of engineers because of their practical applications in industrial, business, and civic life.

Provision is made for a uniform freshman year in the College of Engineering; and the student's choice, at the time of entrance, of a specialized engineering curriculum may be changed, within the limitations of enrollment in the various curricula, prior to entering upon the sophomore year, without loss of time. It is hoped that after a year of college work and on the basis of conferences with members of the faculty, the student who is uncertain of his choice of a specialized engineering field may choose wisely.

The work of the first two years is fairly self-contained. To those who for one reason or another are unable to complete their engineering training, it affords preparation for careers as draftsmen, electricians, surveyors, shop foremen, or assistants in industrial laboratories or plants.

Since the University recognizes that an engineer can not be trained by purely academic process, the degree awarded upon graduation is Bachelor of Science in the particular division of engineering that has been studied, for example, Bachelor of Science in Civil Engineering. The successful completion of one year of full-time graduate study leads to the degree of Master of Science. Professional degrees are conferred after five years of acceptable experience, as noted below.

General Study

The requirement of courses collectively designated "General Study" in the junior and senior years of the several curricula in engineering has as its purpose the extension of the sequence in the humanistic-social field represented in the freshman year by the course "Development of Western Civilization" and in the sophomore year by the course in economics. These first courses are designed to develop a broad knowledge of the political, social, and economic background which is our heritage, and to prepare the student for an intelligent approach to problems in these fields.

The objective of the humanistic-social stem in technical schools has been stated by the American Society for Engineering Education to be "Understanding of the evolution of the social organism within which we live. . . . Development of moral, ethical, and social concepts essential to a satisfying personal philosophy, to a career consistent with the public welfare, and to a sound professional attitude." We conceive it to be the duty of the engineer to be a professional man in the broadest sense of the term, a member of a group whose primary aim is to advance human well-being.

The courses fulfilling the General Study objective will be found in the broad area denoted by social science and the humanities, and accordingly designed to lead to a helpful understanding of the problems of world civilization and to motivation to life as a responsible member of a democratic community. In meeting this requirement broad, general courses will be selected by the student, subject to the approval of his curriculum director, from the fields of history, economics, sociology, and government, wherein knowledge is essential to competence as a citizen; and of literature, philosophy, psychology, biology, fine arts, and music, which afford means for broadening the engineer's intellectual outlook.

The Uniform Freshman Year

An outline follows of the work of the freshman year, uniform for all engineering students. For schedules of the work of the upper three years, varying according to the several specialized curricula, see the subsequent pages.

FIRST SEMESTER			FRESHMAN YEAR			SECOND SEMESTER		
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>
Chem. 4	Gen. Chemistry	4	Chem. 5	Gen. Chemistry	4	Chem. 5	Gen. Chemistry	4
*Engl. 1	Composition & Lit.	3	*Engl. 2	Composition & Lit.	3	*Engl. 12	Composition & Lit.	3
Hist. 11	Dev. W. Civilization ..	3	Hist. 12	Dev. W. Civilization ..	3	Hist. 12	Dev. W. Civilization ..	3
Math. 11	Anal. Geom. & Calc. ..	3	Math. 12	El. Diff. & Int. Cal.	3	Math. 12	El. Diff. & Int. Cal.	3
Phys. 22	Mech. & Prop. of		C.E. 61	Eng. Draw	3	C.E. 61	Eng. Draw	3
	Matter	4	Phys. 22	or Mech. & Prop.		Phys. 22	or Mech. & Prop.	
C.E. 61	or Engr. Draw	3		of Matter	4		of Matter	4
M.S. A.S. 1	Mil./Air Science	2	M.S. A.S. 2	Mil./Air Science	2	M.S. A.S. 2	Mil./Air Science	2
P.E. 1	Physical Education	—	P.E. 2	Physical Education	—	P.E. 2	Physical Education	—

18 or 19

18 or 19

*See footnote on page 92.

Selection of Specialized Curricula

In the second semester of his freshman year each engineering student must select a particular engineering curriculum. This choice must be made at least one month before the end of the semester named.

Inspection Trips

Inspection trips to industrial plants are a required part of specific courses in the various curricula in engineering. Written reports or examinations are required. These trips are under the general direction and supervision of the faculty committee on inspection trips. They are generally held during the senior year and involve an average expense of about \$25.00. The location of the University in the center of industrial activities of various types furnishes unusual opportunities for visits of inspection to engineering plants.

Combined Arts and Engineering Curricula

Students who can afford the extra time and money are urged to spend five years in their collegiate training and to cover the requirements for the B.A. degree as well as those for the B.S. in one of the branches of engineering.

Under the five-year plan the student registers in the College of Arts and Science for four years, earning the B.A. degree on completion of a program which includes, along with specific B.A. training, the fundamental mathematical, scientific, and engineering subjects of the engineering curriculum of his choice. The fifth year is spent in the College of Engineering, carrying on a program leading to the degree of B.S. in his selected branch of engineering. This is usually the senior year curriculum of the chosen branch of engineering.

An engineering student who decides at any stage of his course that he wishes to work for both the B.A. and B.S. degrees, may register in one of the colleges concerned for a period of years and complete the combined requirements of both degrees in five or six years, depending upon the program followed before the decision is made. His curriculum is so arranged that the work for

*Engl. 1 and 2, Composition and Literature, are the courses normally taken in the first and second semesters respectively of the freshman year. Students who demonstrate superior ability in composition on the English placement tests are assigned to Engl. 11 and 12, Types of World Literature. Those whose performance is regarded as unsatisfactory are required to complete successfully Engl. O, Elementary Composition, followed by Engl. 1 and 2.

one degree may be finished at the end of a four-year period, and the work for the subsequent degree at the close of the fifth or sixth year.

Professional Engineering Degrees

Graduates of the various technical curricula of Lehigh University with the degree of Bachelor of Science in Civil Engineering, Mechanical Engineering, Electrical Engineering, Metallurgical Engineering, Mining Engineering, Chemical Engineering, and Industrial Engineering, may be candidates for the corresponding professional degrees, namely, Civil Engineer (C.E.), Mechanical Engineer (M.E.), Electrical Engineer (E.E.), Metallurgical Engineer (Met.E.), Engineer of Mines (E.M.), Chemical Engineer (Ch.E.), and Industrial Engineer (I.E.). To qualify for a professional degree, a candidate must submit evidence of having had, since graduation, at least five years of acceptable experience in the field of engineering corresponding to the degree desired, and must submit also an acceptable thesis, the subject of which must be approved in advance by the department concerned. In exceptional cases, publications of a high order of merit may be accepted in lieu of a formal thesis. Should the degree applied for not correspond in subject matter to the candidate's undergraduate training, evidence must be furnished that any scholastic deficiency has been satisfied.

Graduates of Lehigh University with the degree of Master of Science in one of the engineering fields may be candidates for the appropriate professional degrees on the same basis as holders of a baccalaureate degree. A candidate who has had a year of acceptable graduate work at Lehigh or elsewhere may count the graduate year toward the partial satisfaction of the requirement of five years of acceptable experience.

Declaration of candidacy for professional degrees must be made on or before January 1 of the year in which the candidate expects to receive his degree. Application blanks may be obtained from the registrar. The thesis must be submitted in duplicate (one copy for the department and one for the University Library) on or before March 15 and should be sent directly to the department concerned. Formal application for a professional degree, accompanied by the required fee, must be made before May 15 of the year in which the degree is to be conferred. The fee for such a degree is \$50.00. Professional degrees are conferred only in June.

THE CURRICULUM IN CHEMICAL ENGINEERING

The curriculum in chemical engineering is designed to prepare the student for the profession of chemical engineer, which includes the design, construction, operation, and management of manufacturing establishments in which chemical products are made. Such materials include paper, gasoline and other petroleum products, cement, coke, gas, dyes, electrochemical products, paint, rubber, leather, foods, and other substances. In addition to the primary requirement of chemistry in all its branches, the training of the chemical engineer includes a thorough knowledge of physics and mathematics, and a sound understanding of such fundamentals of chemical, mechanical, and electrical engineering as will make him a competent development, operating, or sales engineer.

After chemical investigations furnish a better understanding of known processes or develop novel processes or novel methods, it is the particular province of chemical engineering to carry them forward into industrial production. The curriculum is not planned to turn out a specialist restricted to any one type of product; the aim is rather to develop expertness in the sciences and fundamental unit manufacturing processes which underlie all chemical engineering. Some familiarity with factory methods under actual working conditions is acquired through contact with operations in nearby plants. Frequent visits for observation and report are made to manufacturing plants in the immediate neighborhood and in the Philadelphia and New York districts.

The graduate of this curriculum is prepared to accept with confidence a position in an industrial laboratory or plant, or to undertake further study at the graduate level leading to an advanced degree in either chemistry or chemical engineering.

THE CURRICULUM IN CHEMICAL ENGINEERING

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 91.

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Chem. 35	Analytical Chem.	4	Chem. 36	Analytical Chem.	4	Chem. 36	Analytical Chem.	4
Eco. 3	Economics	3	Eco. 4	Economics	3	Eco. 4	Economics	3
Math. 13	Calculus	3	Math. 14	Calc. & El. Diff. Eq. ..	3	Math. 14	Calc. & El. Diff. Eq. ..	3
Phys. 24	Elec. & Magnetism	4	Phys. 23	Heat, Sound & Lt.	4	Phys. 23	Heat, Sound & Lt.	4
Mech. 3	Statics & Dynamics	3	Met. 61	Engr. Metallurgy	2	Met. 61	Engr. Metallurgy	2
M.S. A.S. 3	Mil./Air Science	2	Met. 68	Met. Problems	1	Met. 68	Met. Problems	1
P.E. 3	Physical Education	—	M.S. A.S. 4	Mil./Air Science	2	M.S. A.S. 4	Mil./Air Science	2
			P.E. 4	Physical Education	—	P.E. 4	Physical Education	—

THE CURRICULUM IN CHEMISTRY

Chemists constitute nearly one-half of all professional research personnel in industry as shown by the 1940 report of the National Resources Planning Board. The American Chemical Society, which requires professional training and experience for eligibility, has a present membership of about 62,000. The consistently rapid increase in the membership of this society in recent years may be taken as an index of the expanding opportunities in the chemical profession.

The curriculum in chemistry provides a thorough grounding in the fundamentals of this science, with the requisite collateral training in physics and mathematics, and gives some consideration to industrial and engineering principles. In addition to the liberal allotment of time to courses in English, German, economics, history and other non-professional studies, provision is made for twelve semester hours (ordinarily four courses) of professional electives in a minor field of concentration. The tabulation below indicates some of the possibilities of this guided selection of elective courses.

PREPARATION FOR	ELECTIVE SEQUENCE IN
Executive or sales departments	
of chemical industry	Business administration
Plant operation	Chemical engineering
Food and pharmaceutical industries	Biochemistry and bacteriology
Graduate study or research in	
physical chemistry	Physics and mathematics
Teaching, especially in	
public schools	Education
Metals industries	Metallurgy

Since the freshman year of this curriculum is identical with that of chemical engineering, and the sophomore years in the two curricula are nearly the same, it is possible for the student to transfer from one curriculum to the other before the beginning of the junior year without a considerable sacrifice of credits. In a transfer from chemical engineering to chemistry, the extra courses may be utilized as electives.

Seniors in the curriculum in chemistry may arrange to make the supervised visits to industrial plants which are required in the curriculum in chemical engineering.

THE CURRICULUM IN CHEMISTRY

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 91.

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Chem. 35	Analytical Chem.	4	Chem. 36	Analytical Chem.	4	Chem. 36	Analytical Chem.	4
Eco. 3	Economics	3	Eco. 4	Economics	3	Eco. 4	Economics	3
†Ger. 1 or 3	German	3	†Ger. 2 or 4	German	3	†Ger. 2 or 4	German	3
Math. 13	Calculus	3	Math. 14	Calc. & El. Diff. Eq. ..	3	Math. 14	Calc. & El. Diff. Eq. ..	3
Phys. 24	Elec. & Magnetism	4	Phys. 23	Heat, Sound & Lt.	4	Phys. 23	Heat, Sound & Lt.	4
M.S. A.S. 3	Mil./Air Science	2	M.S. A.S. 4	Mil./Air Science	2	M.S. A.S. 4	Mil./Air Science	2
P.E. 3	Physical Education	—	P.E. 4	Physical Education	—	P.E. 4	Physical Education	—
			19			19		

FIRST SEMESTER			JUNIOR YEAR			SECOND SEMESTER		
Chem. No.	Course Title	Cr. Hrs.	Chem. No.	Course Title	Cr. Hrs.	Chem. No.	Course Title	Cr. Hrs.
Chem. 91	Physical Chemistry	3	Chem. 151	Organic Chemistry	3	Chem. 151	Organic Chemistry	3
Chem. 92	Phys. Chem. Lab.	1	Chem. 167	Org. Chem. Lab.	2	Chem. 167	Org. Chem. Lab.	2
Chem. 150	Organic Chemistry	3	Chem. 356	Quant. Org. Anal.	1	Chem. 356	Quant. Org. Anal.	1
Chem. 165	Org. Chem. Lab.	2	Chem. 190	Physical Chem.	3	Chem. 190	Physical Chem.	3
†Ger. 7	Scientific German	3	Chem. 192	Phys. Chem. Lab.	1	Chem. 192	Phys. Chem. Lab.	1
	English Elective	3	Ch.E. 160	Ind. Eng. Chem.	3	Ch.E. 160	Ind. Eng. Chem.	3
	Elective	3		English Elective	3		English Elective	3
P.E. 5	Physical Education	—		Elective	3		Elective	3
			P.E. 6	Physical Education	—		Physical Education	—
			18			19		

SUMMER

Chem. 100. Eight weeks industrial employment with report.

FIRST SEMESTER			SENIOR YEAR			SECOND SEMESTER		
Chem. No.	Course Title	Cr. Hrs.	Chem. No.	Course Title	Cr. Hrs.	Chem. No.	Course Title	Cr. Hrs.
Chem. 337	Adv. Analyt. Chem.	3	Chem. 175	Research Lab.	3	Chem. 175	Research Lab.	3
Chem. 357	Qual. Org. Anal.	3	Chem. 302	Inorganic Chem.	3	Chem. 302	Inorganic Chem.	3
Chem. 194	Phys. & El'trochem.	3	Chem. 179	Hist. & Lit. Chem.	1	Chem. 179	Hist. & Lit. Chem.	1
Chem. 197	Electrochem. Lab.	1	Chem. 358	Adv. Org. Chem.	3	Chem. 358	Adv. Org. Chem.	3
	*General Study	3	Chem. 371	or Elem. Biochem. }	3	Chem. 371	or Elem. Biochem. }	3
	Elective	3		*General Study	3		*General Study	3
P.E. 7	Physical Education	—		Elective	3		Elective	3
			P.E. 8	Physical Education	—		Physical Education	—
			16			16		

*For an elucidation of this requirement see page 90.

†Students in this curriculum are required to pass Ger. 7, Scientific German. Those who are able to omit one or both semesters of the courses prerequisite to Ger. 7 will elect other courses as substitutes.

THE CURRICULUM IN CIVIL ENGINEERING

The purpose of this curriculum is to give instruction in those general and scientific subjects which form the foundation of all engineering, and a special training in the field of civil engineering, which includes the planning and building of highways, airports, railroads, harbors, docks and terminals, bridges, buildings, subways, tunnels, water supply and purification plants, sewage systems and sewage disposal plants, water power developments, the making of surveys, and research.

Many Civil Engineers are associated with consulting engineering firms, contractors or industrial concerns, and are engaged in the conception, design, construction, and operation of both private and public projects; the latter usually being handled through some Federal, State, County, or City Government Agency.

The work of the first three years deals chiefly with the scientific and mathematical basis of engineering practice. All students receive training in Structural Theory and Design, Hydraulics, Engineering Geology, Foundation Engineering, and Sanitary Engineering. Through the use of approved electives in the third and fourth years the student may pursue further work in either Structural, Hydraulic, Transportation, or Sanitary Engineering. Opportunity is provided through an elective for a student to determine if he has an interest in and aptitude for research. Emphasis is placed on developing the ability to prepare and present reports through courses in Speech or Technical Writing and the senior Seminar.

All Civil Engineering students attend a six weeks Summer Surveying Session usually off the campus.

Special 5-year combined programs leading to the degrees B.S. in C.E. and either B.A., B.S. in Bus. Adm. or B.S. in M.E. are easily arranged.

Recently there came a great increase in the insistence of engineers, through their professional societies, educational and technical alike, that the engineering student be trained as a professional man, rather than a technician, with a sound understanding of the obligation he owes to society. This training is provided by the humanistic-social courses extending through the four years and selected with the advice and approval of the curriculum director.

ENGINEERING

THE CURRICULUM IN CIVIL ENGINEERING

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 91.

SUMMER

C.E. 40 Land & Topographic Surveying 3
C.E. 41 Route Surveying 3

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.		Course Title Cr. Hrs.	Course No.		Course Title Cr. Hrs.	Course No.		Course Title Cr. Hrs.
Eco.	3	Economics	3	Eco.	4	Economics	3	
Math.	13	Cal. & Sol.	3	Math.	14	Calc. & El. Diff. Eq. ..	3	
		Anal. Geo.	3	Mech.	2	Dynamics	3	
Mech.	1	Statics	3	Phys.	24	Elect. & Magnetism	4	
Phys.	23	Heat, Sound & Lt.	4			Approved Elective	3	
C.E.	42	Highway Engrng.	3	M.S. A.S.	4	Mil./Air Science	2	
M.S. A.S.	3	Mil./Air Science	2	P.E.	4	Physical Education	—	
P.E.	3	Physical Education	—					
			18			18		

THE CURRICULUM IN ELECTRICAL ENGINEERING

The electrical engineer is one who practices the science and art of economically "directing the sources of electrical power in nature for the uses and conveniences of man." He may design, manufacture, install, or operate electrical machinery and equipment, manage plants and electric systems, or engage in the promotion of engineering projects.

The object of this curriculum is to give instruction in those general and scientific subjects which underlie all the branches of engineering, and to give special training in those technical and business subjects which experience shows are most essential in the equipment of the electrical engineer. In seeking to accomplish this object the department puts chief emphasis upon mastery of the mathematical-physical principles and thoroughness in the analysis of problems.

The curriculum provides a balanced allotment of time in each of four principal divisions: (1) mathematics and the basic sciences, (2) electrical engineering, (3) allied branches of engineering, and (4) non-technical subjects in arts and business. In order to make maximum use of the available time, the electrical courses are highly coordinated with respect to classroom and laboratory work; concurrent courses are designed to augment and supplement each other; and consecutive courses to extend and build upon the previous courses.

In recognition of different talents and inclinations among individuals, and of specialization in industry, three separate options are offered in the senior year: (1) the Power Option for those interested in the technical aspects of design, operation, and development of electrical machinery and power systems; (2) the Communications Option for those interested in the technical aspects of wire or radio communication; and (3) the General Option for those less interested in technical applications and more inclined toward commercial, managerial and executive assignments. The work of the first three years and some of that in the senior year is identical for each option; so that all graduates will have had the same basic work. Thus, although a student elects a particular option, he has a foundation sufficiently fundamental to enable him to enter any branch of electrical engineering.

ENGINEERING

THE CURRICULUM IN ELECTRICAL ENGINEERING

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 91.

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3	Eco. 3	Economics	3
Math. 13	Calc. & Sol.	3	E.E. 2	Dir. Cur. Machines	3	E.E. 2	Dir. Cur. Machines	3
	Anal. Geo.	3	E.E. 3	Direct Cur. Lab.	1	E.E. 3	Direct Cur. Lab.	1
Mech. 1	Statics	3	Math. 14	Calc. & El. Diff. Eq. ..	3	Math. 14	Calc. & El. Diff. Eq. ..	3
Met. 63	Engr. Metallurgy	3	Mech. 2	Dynamics	3	Mech. 2	Dynamics	3
M.S. A.S. 3	Mil./Air Science	2	M.S. A.S. 4	Mil./Air Science	2	M.S. A.S. 4	Mil./Air Science	2
Phys. 24	Elec. & Magnetism	4	Phys. 23	Heat, Sound & Lt.	4	Phys. 23	Heat, Sound & Lt.	4
P.E. 3	Physical Education	—	P.E. 4	Physical Education	—	P.E. 4	Physical Education	—
			18			19		

FIRST SEMESTER			JUNIOR YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
E.E. 104	Alt. Cur. Circuits	3	E.E. 106	Alt. Cur. Machines	3	E.E. 106	Alt. Cur. Machines	3
E.E. 105	Alt. Cur. Cir. Lab.	1	E.E. 107	A.C. Mach. Lab.	1	E.E. 107	A.C. Mach. Lab.	1
Math. 207	Adv. Calculus	3	E.E. 110	Indust. Electronics	3	E.E. 110	Indust. Electronics	3
Mech. 111	Mech. of Materials	3	Mech. 121	Mech. of Fluids	3	Mech. 121	Mech. of Fluids	3
Mech. 113	Mat. Testing Lab.	1	Mech. 123	Hydraulics Lab.	1	Mech. 123	Hydraulics Lab.	1
M.E. 104	Thermodynamics	3	M.E. 105	Thermodynamics	3	M.E. 105	Thermodynamics	3
Phys. 110	Adv. Elect. Lab.	1	Phys. 111	Adv. Elect. Lab.	1	Phys. 111	Adv. Elect. Lab.	1
	*General Study	3		*General Study	3		*General Study	3
P.E. 5	Physical Education	—	P.E. 6	Physical Education	—	P.E. 6	Physical Education	—
			18			18		

SUMMER

E.E. 100, Industrial Employment

FIRST SEMESTER			SENIOR YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
M.E. 162	Mech. Engrg. Lab.	1	E.E. 111	Proseminar	1	E.E. 111	Proseminar	1
	*General Study	3	M.E. 163	Mech. Engrg. Lab.	1	M.E. 163	Mech. Engrg. Lab.	1
			Speech 30	Fund. of Speech	3	Speech 30	Fund. of Speech	3

POWER OPTION

E.E. 108	Alt. Cur. Mach.	3	E.E. 332	Elec. Transients	3
E.E. 109	A.C. Mach. Lab.	2	E.E. 334	Trans. Line Trans.	3
E.E. 331	Elec. & Mag. Fields ...	3	E.E. 336	System Stability	3
E.E. 133	Transmission Lines	3	E.E. 337	Adv. Mach. Theory	3
E.E. 335	Symmetrical Comp.	3	E.E. 338	Transients Lab.	1

COMMUNICATIONS OPTION

E.E. 331	Elec. & Mag. Fields ...	3	E.E. 108	Alt. Cur. Mach.	3
E.E. 141	Radio Commun.	4	E.E. 109	A.C. Mach. Lab.	2
E.E. 143	Wire Commun.	3	E.E. 332	Electric Transients	3
E.E. 345	Electromag. Theory	3	E.E. 142	Radio Commun.	3
			E.E. 144	Wire Commun.	3

GENERAL OPTION

E.E. 108	Alt. Cur. Mach.	3	Acctg. 104	Accounting	3
E.E. 109	A.C. Mach. Lab.	2	E.E. 332	Transients	3
E.E. 133	Transmission Lines	3	E.E. 120	Ind. Application	4
E.E. 335	Symmetrical Comp.	3	Fin. 125	Corp. Finance	3
Law 101	Business Law	3	P.E. 8	Physical Education	—
P.E. 7	Physical Education	—			

17 or 18

18 or 19

*For an elucidation of this requirement see page 90.

THE CURRICULUM IN ENGINEERING PHYSICS

The curriculum in engineering physics is designed to prepare men for careers in scientific work. Primary emphasis is placed on the fundamental principles of physics, and this is carefully coordinated with thorough laboratory training. The first two years of work are similar to those in any of the engineering curricula, and some further engineering study is required in addition to the work in physics during the final two years. The training is thus consciously practical.

The complete curriculum is not dictated. A liberal number of electives, particularly in the senior year, provides unusual flexibility in allowing the curriculum to be adapted to the needs and interests of the individual student. Those whose interests lie in the theoretical or analytical phases of their science, or who are preparing for graduate study, usually elect additional courses in mathematics and physics. Many others elect additional work in chemistry, engineering, geophysics, education, or business, or further studies in the social sciences and the humanities.

Graduates are prepared to start their professional careers as physicists. They are equipped for work in pure or applied science: their primary function is the solution of problems which have not yet been reduced to standard engineering practice.

ENGINEERING

THE CURRICULUM IN ENGINEERING PHYSICS

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 91.

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.		Course Title Cr. Hrs.	Course No.		Course Title Cr. Hrs.	Course No.		Course Title Cr. Hrs.
Chem.	91	Physical Chem.	3	Eco.	4	Economics	3	
Eco.	3	Economics	3	†Ger.		German	3	
†Ger.		German	3	or		Approved Elec.	3	
or						Calc. & El. Diff. Eq. ..	3	
		Approved Elec.	3	Math.	14	Statics & Dynamics ...	3	
Math.	13	Calc. & Sol.	3			Heat, Sound & Lt.	4	
		Anal. Geo.	3	Phys.	23	Mil./Air Science	2	
Phys.	24	Elec. & Magnetism	4	M.S. A.S.	4	Physical Education	—	
M.S. A.S.	3	Mil./Air Science	2	P.E.	4			
P.E.	3	Physical Education	—					
			18				18	

FIRST SEMESTER			JUNIOR YEAR			SECOND SEMESTER		
E.E.	104	A.C. Circuits	3	Mech.	302	Adv. Dynamics	3	
E.E.	105	and A.C. Lab.	1	Phys.	111	Elect. Lab	1	
or			4	Phys.	191	Lab. Techniques	1	
E.E.	160	El. Cir. & App.	3	Phys.	213	Theo. Elec. & Mag. ...	3	
E.E.	161	and El. Probs.	1	Phys.	252	Optics	4	
E.E.	162	and Dyn. Lab.	1			*General Study	3	
Math.	206	Adv. Calculus	3	P.E.	6	Elective	3	
Phys.	110	Elect. Lab	1			Physical Education	—	
Phys.	212	Theo. Elec. & Mag. ...	3					
Phys.	340	Heat & Thermo.	4					
		*General Study	3					
P.E.	5	Physical Education	—					
			18 or 19				18	

SUMMER

Phys. 100, Industrial Employment

FIRST SEMESTER			SENIOR YEAR			SECOND SEMESTER		
Phys.	314	Phys. of Electronics	4	Phys.	269	Modern Theories	3	
Phys.	268	Modern Theories	3	Phys.	193	Advanced Lab.	2	
Phys.	192	Advanced Lab.	2	Phys.	171	Proseminar	1	
Phys.	362	Spectroscopy		Phys.	315	Electric Waves	4	
		or	3	or		Mod. Th. Solids	3	
		Elective	3	Phys.	363	if Phys. 362 has	or	
		*General Study	3	or		been completed	3	
		Electives	3	Elective,		*General Study	3	
P.E.	7	Physical Education	—			Electives	4-6	
				P.E.	8	Physical Education	—	
			18				17 or 18	

*For an elucidation of this requirement see page 90.

†Students who have had no German in preparatory school will take Ger. 1 and 2, Elementary German. Those who offer two units of German for entrance will take Ger. 3, Intermediate German, and Ger. 7, Scientific German. Students whose previous training, formal or otherwise, in the language represents more than the equivalent of two years of preparatory school German will take, at the discretion of the curriculum director, three or six hours of work in other fields instead of German, the specific courses to be designated by the curriculum director.

THE COMBINED FIVE YEAR CURRICULUM IN ELECTRICAL ENGINEERING AND ENGINEERING PHYSICS

This curriculum is designed to meet the needs of those who plan a career in electronics and communications research and development. It differs from the standard four year communication Option in Electrical Engineering in that certain courses of primary interest to power engineers have been replaced by subjects in physics and mathematics. It differs from the four-year curriculum in Engineering Physics with a communications minor in that the fundamental electrical engineering courses in fields, transients, and machines have been added. The similarity of the basic requirements of the two curricula permits the inclusion of the necessary advanced work in mathematics and dynamics.

For men planning careers in the electronics—communications area, it is believed that the greater breadth of training afforded by this combined program is preferable to early specialization in either field alone. However, it should be particularly noted that this program lays a solid foundation for graduate study in either physics or electrical engineering.

It is expected that students undertaking this combined program will make every effort to complete the full five years. In any case the B.S. (E.E.) degree is conferred on the successful completion of the fourth year, and the B.S. (E.P.) degree at the end of the fifth year.

THE COMBINED FIVE YEAR CURRICULUM IN ELECTRICAL ENGINEERING AND ENGINEERING PHYSICS

SECOND SEMESTER

FIRST SEMESTER			SOPHOMORE YEAR		SECOND SEMESTER		
<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Cr. Hrs.</i>		
Math. 13	Calculus	3	Math. 14	Calculus	3		
Phys. 24	Elec. & Magnetism	4	Phys. 23	Heat, Light, Sound	4		
Mech. 1	Statics	3	Mech. 2	Dynamics	3		
Chem. 91	Physical Chemistry	3	E.E. 2	D.C. Machines	3		
Eco. 3	Economics	3	E.E. 3	D.C. Laboratory	1		
M.S. A.S. 3	Mil./Air Science	2	Eco. 4	Economics	3		
P.E. 3	Physical Education	—	M.S. A.S. 4	Mil./Air Science	2		
			P.E. 4	Physical Education	—		
		18			19		

SECOND SEMESTER

E.E.	104	A.C. Circuits	3	E.E.	106	A.C. Machines	3
E.E.	105	A.C. Laboratory	1	E.E.	107	A.C. Laboratory	1
Math.	207	Adv. Calculus	3	E.E.	107	Industrial Electronics	3
Mech.	111	Mech. Materials	3	Mech.	302	Adv. Dynamics	3
Mech.	113	Mat. Test. Laboratory	1	Phys.	111	Adv. Phys. Laboratory	1
Phys.	110	Adv. Elec. Laboratory	1	Phys.	252	Geometrical and Physical Optics	4
Phys.	340	Heat, Thermodynamics and Pyrometry	3			*General Study	3
		*General Study	3	P.E.	6	Physical Education	3
P.E.	5	Physical Education	3				
			10				18

Industrial Employment

SECOND SEMESTER

E.E.	331	Elec. Mag. Fields	3	E.E.	332	Elec. Transients	3
E.E.	141	Radio Communication	4	E.E.	142	Radio Communication	3
E.E.	143	Wire Communication	3	E.E.	144	Wire Communication	3
E.E.	345	Electromagnetic Theory	3	E.E.	108	A.C. Machines	3
Math.	315	Func. of a Comp. Var.	3	E.E.	109	A.C. Machines Lab.	2
		*General Study	3			*General Study	3
P.E.	7	Physical Education	—	E.E.	111	Proseminar	1
				P.E.	8	Physical Education	—
			19				18

SECOND SEMESTER

Math.	301	Vectors & Tensor Ana.	3	Math.	322	Diff. Eq. & Harm. Ana.	3
Math.	324	Theory of Errors	3			Approved Elective	3
Phys.	314	Phys. of Electronics	4	Phys.	363	Modern Th. of Solids	3
Phys.	268	Modern Theories	3	Phys.	267	Modern Theories	3
Phys.	192	Ad. Laboratory	2	Phys.	193	Adv. Laboratory	2
Ger.	1	German or		Ger.	2	German or	
		Approved Elective	3			Approved Elective	3
				Phys.	171	Proseminar	1
			18				18

- 105 -

THE CURRICULUM IN INDUSTRIAL ENGINEERING

There is a growing tendency on the part of industries to select young men from their engineering departments for managerial positions. Because of this, the Industrial Engineering curriculum, although basically and primarily engineering, is adequately supplemented by courses in business administration, management and psychology to enable the Industrial Engineering graduate to accept and succeed in these opportunities.

The curriculum is designed with the principal aim of Industrial Engineering in view, which is the improvement of the general standard of living as the result of increased worker productivity by the application of the principles of scientific management and the utilization of technical improvements when economically justifiable.

Throughout the program there is an integrated series or sequence in the major field which includes not only basic and fundamental courses, but specialized courses as well, in the fields of production planning and control, quality control, product engineering, work simplification, wage and salary administration and industrial relations.

It is the aim of the Industrial Engineering program to develop for industry a potential manager, a graduate well grounded in engineering fundamentals, trained in the principles of economics, finance, accounting and psychology, and adequately prepared to practice the profession of Industrial Engineering.

THE FIVE YEAR COMBINED CURRICULUM INDUSTRIAL ENGINEERING AND BUSINESS ADMINISTRATION

Students with definite objectives in mind which require more concentration in business administration may elect to pursue a five year program which combines the two curricula of industrial engineering and business administration. This combined curriculum will lead to the degree B.S. in Industrial Engineering at the end of the fourth year and B.S. in Business Administration at the end of the fifth year. The first four years are essentially the standard industrial engineering curriculum except as noted: For the fifth year please see page 84 under Business Administration.

SECOND SEMESTER

18

FIRST SEMESTER

SECOND SEMESTER

P.E. 6

19

FIRST SEMESTER

SECOND SEMESTER

P.E. 8

17

NOTE: The Freshman, Sophomore, and Junior years of the five year program are as above except the second semester Junior G.S.O. is removed and E.S. 246 Business Cycles and Forecasting substituted therefore.

FIRST SEMESTER

SECOND SEMESTER

P.E. 8

17

******I.E. 326, 328, 330.

THE CURRICULUM IN MECHANICAL ENGINEERING

Mechanical engineering deals with the design, construction, installation, and operation of machinery necessary for the economical and advantageous use of power, and with the management of industries and organizations manufacturing and using power-driven equipment. The high degree of technical skill and efficiency essential to the work of research, design, construction, and operation, which underlies mechanical engineering practice, necessarily prescribes a training based on the fundamental sciences of chemistry, physics, and mathematics.

Aptitude and skill in the interpretation and application of the basic technical sciences are, however, not sufficient. In addition the engineer must acquire an understanding of the influences of his profession on social institutions and traditions. To this end the curriculum requires the student to register for courses in the College of Arts and Science or the College of Business Administration, or both, during each of the four years.

The curriculum is broad, and designed to meet the needs of young men interested in the scientific and technical aspects of industry. During the first three years emphasis is placed on the fundamental principles underlying the numerous fields of mechanical engineering. In the senior year opportunity is provided for concentration in one of three broad fields; Power, Design, or Basic Sciences underlying Mechanical Engineering. The young graduate ordinarily enters a graduate apprenticeship in a public utility, manufacturing, or operating organization where opportunity is provided for his development in research, design, construction and operation, depending upon his interests and aptitudes and the opportunities available.

ENGINEERING

THE CURRICULUM IN MECHANICAL ENGINEERING

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 91.

SUMMER

M.E. 1, Machine Shop Practice (3)

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Eco. 3	Economics	3	Eco. 4	Economics	3	Eco. 4	Economics	3
Math. 13	Calc. & Sol.	3	I.E. 13	Elem. Ind. Engrg.	3	I.E. 13	Elem. Ind. Engrg.	3
	Anal. Geo.	3	Math. 14	Calc. & El. Diff. Eq.	3	Math. 14	Calc. & El. Diff. Eq.	3
M.E. 2	Elem. Mach. Des.	3	Mech. 2	Dynamics	3	Mech. 2	Dynamics	3
Mech. 1	Statics	3	Phys. 24	Elec. & Magnetism	4	Phys. 24	Elec. & Magnetism	4
Phys. 23	Heat, Sound & Lt.	4	M.S. A.S. 4	Mil./Air Science	2	M.S. A.S. 4	Mil./Air Science	2
M.S. A.S. 3	Mil./Air Science	2	P.E. 4	Physical Education	—	P.E. 4	Physical Education	—
P.E. 3	Physical Education	—						
		18						18

FIRST SEMESTER			JUNIOR YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Math. 206	Adv. Calculus	3	M.E. 102	Machine Design	3	M.E. 102	Machine Design	3
M.E. 104	Thermodynamics	3	M.E. 105	Thermodynamics	3	M.E. 105	Thermodynamics	3
M.E. 106	Instruments Lab.	1	M.E. 107	Mech. Engrg. Lab.	1	M.E. 107	Mech. Engrg. Lab.	1
Mech. 121	Mech. of Fluids	3	E.E. 160	Elec. Cir. & Appar.	3	E.E. 160	Elec. Cir. & Appar.	3
Mech. 123	Hydraulics Lab.	1	E.E. 161	Elec. Problems	1	E.E. 161	Elec. Problems	1
Mech. 111	Mech. of Materials	3	E.E. 162	Dynamo Lab.	1	E.E. 162	Dynamo Lab.	1
Mech. 113	Mat. Testing Lab.	1	Met. 61	Engr. Metallurgy	2	Met. 61	Engr. Metallurgy	2
	*General Study	3	Met. 68	Met. Problems	1	Met. 68	Met. Problems	1
P.E. 5	Physical Education	—		*General Study	3		*General Study	3
		18	P.E. 6	Physical Education	—	P.E. 6	Physical Education	—
					18			18

SUMMER

I.E. 100, Industrial Employment

FIRST SEMESTER			SENIOR YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
M.E. 108	Mech. Engrg. Lab.	2	Acctg. 104	Acctg. for Engrs.	3	Acctg. 104	Acctg. for Engrs.	3
M.E. 103	Adv. Mach. Design	3	M.E. 109	I.C. Engine Lab.	2	M.E. 109	I.C. Engine Lab.	2
†M.E. 65	Adv. Mech. Engrg.	3	†M.E. 66	Adv. Mech. Engrg.	3	†M.E. 66	Adv. Mech. Engrg.	3
Met. 65	Metallurgical Lab.	1	Met. 66	Metallurgical Lab.	1	Met. 66	Metallurgical Lab.	1
	†Technical Option	6		†Technical Option	6		†Technical Option	6
	*General Study	3		*General Study	3		*General Study	3
P.E. 7	Physical Education	—	P.E. 8	Physical Education	—	P.E. 8	Physical Education	—
		18			18			18

1 Heat Power Option

FIRST SEMESTER			SECOND SEMESTER		
2 of these			2 of these		
M.E. 321	Heat Transfer	3	M.E. 333	Power Plants	3
M.E. 322	Mech. of Comp. Fl.	3	M.E. 331	Air Cond. & Refrig.	3
M.E. 330	Air Cond.	3	M.E. 334	Int. Comb. Eng.	3
M.E. 320	App. Thermo.	3	M.E. 110	Thesis	3
		6			6

(Continued on following page)

*For an elucidation of this requirement see page 90.

†Advanced M.E. courses to be chosen, with the approval of the curriculum director, on the basis of the individual's interests.

‡These Technical Option courses are to be selected from one of the three options on this page and page 110.

II Design Option							
2 of these				2 of these			
M.E.	341	Stress Anal. for Design	3	M.E.	340	Adv. Mach. Des.	3
Math.	301	Vector Anal.	3	M.E.	342	Vibration Anal.	3
Math.	221	Diff. Equations	3	Math.	322	Diff. Equations	3
M.E.	322	Mech. of Comp. Fl.	3	C.E.	160	Structural Design	3
			6				6
III General Option							
2 of these				2 of these			
Math.	315	Functions of		Math.	324	Theory of Errors	3
		Complex Var.	3	Mech.	226	Aerodynamics	3
Mech.	225	Aerodynamics	3	Phys.	269	Modern Phys. Theory	3
Phys.	268	Modern Phys. Theory	3	or		Any course from	
or		Any course from				Options I or II	
			6				6

THE COMBINED FIVE YEAR CURRICULUM IN MECHANICAL AND ELECTRICAL ENGINEERING

This curriculum is designed to meet the needs of the power engineer engaged in the operation of large public utilities for the generation and distribution of electrical energy, as well as for those concerned with the design of electrical machines and apparatus. It is generally recognized that the engineering work of the electrical manufacturers and public utilities in the power field encounters as many mechanical as electrical problems. These two types of problems are equally important and equally interesting. In order to carry out the design of electrical machinery and power plants it is now generally necessary to employ both mechanical and electrical engineers on the same job because, with rare exceptions, one engineer is not proficient in both fields.

This combined 5-year curriculum in ME and EE is intended to circumvent this deficiency in the present training of power engineers by offering a highly integrated, comprehensive, and balanced program which is devised to turn out graduates equally proficient in mechanical and electrical engineering and who in addition will have some grounding in those business courses which are deemed essential to the engineer when he eventually takes on executive and administrative responsibilities.

It is the intent of this curriculum that anyone undertaking it will make every effort to complete the five years. In any case, the BS(ME) degree will be conferred at the end of the fourth year, and the BS(EE) at the end of the fifth year.

ENGINEERING

THE COMBINED FIVE YEAR CURRICULUM IN MECHANICAL-ELECTRICAL ENGINEERING

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 91.

SUMMER

M.E. 1, Machine Shop Practice (3)

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Math. 13	Calc. & Sol.	3	Math. 14	Calc. & El. Diff. Eq.	3			
	Anal. Geo.	3	Phys. 23	Heat, Light, Sound	4			
Phys. 24	Elec. & Mag.	4	Mech. 2	Dynamics	3			
Mech. 1	Statics	3	E.E. 2	D.C. Machines	3			
Met. 61	Engr. Metallurgy	2	E.E. 3	D. C. Lab.	1			
Met. 68	Met. Engr. Probs.	1	Eco. 4	Economics	3			
Eco. 3	Economics	3	M.S. A.S. 4	Mil./Air Science	2			
M.S. A.S. 3	Mil./Air Science	2	P.E. 4	Physical Education	—			
P.E. 3	Physical Education	—						
			18			19		

THE CURRICULUM IN METALLURGICAL ENGINEERING

Metallurgical engineering formerly signified the production and refining of metals for industrial and military use. More recently the applications of science to alloying, rolling and forging, heat treatment, machining, and welding, the later stages in the manufacturing processes, have widened the field. A sound general education, coupled with thorough grounding in basic science and general engineering, remain, however, the wisest preparation for the specialist in any of these fields.

Outside of the basic studies in science, general engineering, and metallurgy required of all for the degree, flexibility is provided in the curriculum to permit its adaptation to the individual abilities, prospects, and plans of the student by means of electives. Thus, in addition to acquiring a knowledge of the essential basic subjects, the student can develop in the direction of research with advanced courses in chemistry, physics, mathematics, German, and research; toward plant operation with electives such as labor problems, psychology, and industrial management; or toward the business side of metallurgy with courses such as advanced economics, sociology, and accounting.

School of Metallurgical Engineering Practice

Details will be found in the Description of Courses, Metallurgical Engineering section.

THE CURRICULUM IN METALLURGICAL ENGINEERING

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 91.

FIRST SEMESTER			SOPHOMORE YEAR		SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course Title	Cr. Hrs.
Chem. 38	Analytical Chem...	3	Eco. 4	Economics	3	Economics	3
Geol. 1	Prin. of Geology..	3	Math. 14	Calc. & El.	3	Calc. & El.	3
Eco. 3	Economics	3	Mech. 2	Diff. Eq.	3	Diff. Eq.	3
Math. 13	Calc. & Sol.	3	Met. 1	Dynamics	3	Dynamics	3
Mech. 1	Anal. Geo.	3	Phys. 23	Intro. to Met.	3	Intro. to Met.	3
Phys. 24	Statics	3	M.S. A.S.	Heat, Sound & Lt.	4	Heat, Sound & Lt.	4
M.S. A.S.	Elec. & Magnetism	4	P.E. 4	Mil./Air Science	2	Mil./Air Science	2
P.E. 3	Mil./Air Science	2		Physical Education	—	Physical Education	—
	Physical Education	—					
		18					18

FIRST SEMESTER			JUNIOR YEAR		SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course Title	Cr. Hrs.
Chem. 91	Phys. Chemistry	3	Chem. 190	Phys. Chemistry	3	Phys. Chemistry	3
Engl. 36	World Literature	3	Mech. 111	Mech. of Materials	3	Mech. of Materials	3
Met. 102	Met. of Iron & Steel	3	Mech. 113	Mat. Testing Lab.	1	Mat. Testing Lab.	1
Met. 105	Electrometallurgy	2	Met. 112	Iron & Steel Prob.	1	Iron & Steel Prob.	1
Met. 107	Electrochem. Lab.	1	Met. 231	Metallography	3	Metallography	3
Met. 230	Physical Metallurgy	3		Engr. Elective	3	Engr. Elective	3
	Elective	3		*General Study	3	*General Study	3
P.E. 5	Physical Education	—	P.E. 6	Physical Education	—	Physical Education	—
		18					17

SUMMER

Met. 100, Summer Employment

FIRST SEMESTER			SENIOR YEAR		SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course Title	Cr. Hrs.
M.E. 166	Proced. of Mech.	3	E.E. 160	Elec. Cir. & Appar.	3	Elec. Cir. & Appar.	3
Met. 103	Design	3	E.E. 161	Elec. Problems	1	Elec. Problems	1
Met. 338	Non-ferrous Met.	3	E.E. 162	Dynamo Lab.	1	Dynamo Lab.	1
Met. 352	Met. Colloquium	2	Met. 104	Non-ferrous Met..	2	Non-ferrous Met..	2
Met. 363	Adv. Met. of Iron	3	Met. 364	Non-ferrous Met.	1	Non-ferrous Met.	1
	& Steel	3		Prob.	1	Prob.	1
	Non-ferrous Met.	1		or	3	or	3
P.D. 101	Prob.	1	Met. 358	Elective	3	Elective	3
	Professional Devel.	1	Met. 375	Industrial Met.	2	Industrial Met.	2
	Elective	3	P.D. 102	Elec. Proj. in Met.	2	Elec. Proj. in Met.	2
	*General Study	3		Professional Devel.	1	Professional Devel.	1
P.E. 7	Physical Education	—	P.E. 8	*General Study	3	*General Study	3
		19		Physical Education	—	Physical Education	—
							16

*For an elucidation of this requirement see page 90.

THE CURRICULUM IN MINING ENGINEERING

Mining engineering concerns itself with the search for, extraction from the ground, and the initial preparation of the minerals and rocks that are needed to meet the demands of our modern civilization. So basic is the mining industry, so dependent on it are all individuals and industries, that ours has been called a "mineral civilization." Three great classes of materials are provided by the mining engineer: mineral fuels, including coal, petroleum, and natural gas; ores of the metals; non-metallics, such as slate, limestone, gypsum, sand and gravel, and scores of others.

All the operations at the mine are within the responsibility of the mining engineer. The actual work of extraction may be only one of his activities, for he may also have to deal with exploration, plant construction, transportation, preparation and processing, and all phases of mine administration. Modern mining has become, in many cases, a mass-production industry. The mechanization of mines has gone forward with startling rapidity. Electrical applications are found in every phase of the industry. The need for engineering training was never more important.

The curriculum in mining engineering includes the basic sciences common to all branches of engineering—mathematics, physics, chemistry, and mechanics. During the last two years a thorough and progressive training is given in the principles of mining and the methods used in extraction. Special attention is directed to the mechanization of mine operations; to mine ventilation, transportation, economics and administration; and to coal preparation and ore dressing. Technical courses in civil, electrical and mechanical engineering form a part of this advanced work.

Electives in the senior year permit the student to take additional work in business administration or in geology, or he may choose the basic courses in geophysics. On the other hand, he may prefer added courses in other engineering departments.

For those students who have decided by the end of the sophomore year that they wish to specialize in geophysics, an option in engineering geophysics has been established. In this option courses in geophysics, advanced mathematics and physics, and in geology replace certain courses in engineering technology that are required in the regular mining curriculum.

ENGINEERING

THE CURRICULUM IN MINING ENGINEERING

FIRST SEMESTER

FRESHMAN YEAR

SECOND SEMESTER

See page 91.

SUMMER

C.E. 40, Land and Topographic Surveying (3)

FIRST SEMESTER			SOPHOMORE YEAR			SECOND SEMESTER		
Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.	Course No.	Course Title	Cr. Hrs.
Chem. 38	Analytical Chem.	3	Eco. 4	Economics	3	Eco. 14	Calc. & El. Diff. Eq. ..	3
Eco. 3	Economics	3	Math. 14	Math.	3	Mech. 2	Dynamics	3
Math. 13	Calc. & Sol.	3	Min. 2	Mine Surveying	2	Phys. 24	Elec. & Magnetism	4
	Anal. Geo.	3		Phys.	4		Mil./Air Science	2
Mech. 1	Statics	3		M.S. A.S. 4			Physical Education	—
Phys. 23	Heat, Sound & Lt.	4		P.E. 4				
M.S. A.S. 3	Mil./Air Science	2						
P.E. 3	Physical Education	—						
		18						17

LEHIGH UNIVERSITY

SUMMER

Min. 20, Summer Employment

FIRST SEMESTER			SENIOR YEAR		SECOND SEMESTER		
Eng. Geop.	301	Seismic & Mag. Pr.	3	Eng. Geop.	302	El. & Grav. Prosp.	3
Mech.	121	Mech. of Fluids	3	Engl.	42	Technical Writing	3
Min.	205	Mining Economics	3	Geol.	312	Stratigraphy	3
Phys.	314	Elec. Disch. thru Gases 4		Geol.	223	Structural Geol.	3
		*General Study	6	Min.	206	Mine Administration ..	2
P.E.	7	Physical Education	—			*General Study	3
				P.E.	8	Physical Education	—
			19				17

*For an elucidation of this requirement see page 90.

The Graduate School

The Graduate School

Administrative Officers

Martin Dewey Whitaker, *President*

Earl Kenneth Smiley, *Vice-President*

Harvey Alexander Neville, *Dean*

Clarence Bowen Campbell, *Acting Director of Admissions*

James Harold Wagner, *Acting Registrar*

James Decker Mack, *Librarian*

Executive Committee of the Graduate Faculty

Dean Neville, *Chairman*, President Whitaker, and Vice-President Smiley (*ex officio*), Professors C. D. Jensen, Harmon, Myers, Severs, and Hartman.

Graduate study was a part of the original plan of the University and was announced in its first Register in 1866. More definite organization of the work along lines that are now generally accepted dates from 1883. Since that time the degrees of Master of Arts and Master of Science have been offered without interruption. The degree of Doctor of Philosophy was also announced for a time and twice conferred. In the middle nineties this degree was withdrawn; and doctoral work was not again offered until 1936, when it was once more authorized by the trustees. In this same year the Graduate School was organized, with a Graduate Faculty which has full power to enact the necessary legislation governing

the work of the School. The Faculty is composed of the administrative officers of the Graduate School, the Deans of the Colleges, and all professors, associate professors and assistant professors who offer work for graduate credit. The rules and regulations of the Faculty are administered by an Executive Committee composed of the President and Vice-President of the University, the Dean of the Graduate School, and five elected members of the Graduate Faculty.

The Graduate School, in certain areas, offers to students with adequate preparation and ability opportunity for advanced study of an intensive kind and for training in the methods of investigation and research, with a view to their development as scholars and independent investigators in the fields of their choice. The School also aims to serve the needs of teachers and prospective teachers in elementary and secondary schools by providing opportunities for advanced professional training, and by preparing them for administrative positions.

Major work leading to the master's degree may be taken in the following fields: bacteriology, biology, chemical engineering, chemistry, civil engineering, education, electrical engineering, English, geology, history and government, industrial engineering, international relations, mathematics, mechanical engineering, metallurgical engineering, mining engineering, physics, and psychology. In the fields of accounting, economics, finance, Greek, Latin, German, French, philosophy, sociology and Spanish, major work is not offered; but students majoring in other fields may take collateral work in these fields from the list of courses acceptable for graduate credit ("200" courses).

Work leading to the doctor's degree is offered in the following fields: bacteriology, chemical engineering, chemistry, civil engineering, electrical engineering, English, geology, history, mathematics, mechanical engineering, metallurgical engineering, and physics.

Prospective students who are interested in taking graduate work in particular fields are advised to get in touch with the heads of the departments concerned before attempting to register. Such consultation will be to their benefit, in that they will get a definite understanding as to the adequacy of their preparation, as well as of the facilities the University has to offer for the work which they desire.

Admission to Graduate Standing

A student who has taken the bachelor's degree or a degree in technology at a recognized college, university, or technical institution is eligible for admission as a graduate student. Actual admission is subject to enrollment limitations in each department, and is therefore competitive. Each candidate must file at the Office of Admissions, on a form provided for the purpose, a statement of his collegiate experience and of his graduate objectives, and an official transcript of his academic record. The submission of Graduate Record Examination scores by a student applying for admission is urged and sometimes required. (For information about this examination, write to the Educational Testing Service, P. O. Box 592, Princeton, New Jersey.) If a student is applying for admission to graduate work in the Department of Education, scores may be submitted for either the Graduate Record Examination or the National Teachers Examination.

Admission to graduate standing permits the student to take any course for which he has the necessary qualifications. It does not imply admission to candidacy for a degree. Admission to candidacy for an advanced degree is granted in accordance with the provisions set forth below under "Degrees." Upon the recommendation of the department head concerned, if Graduate Record Examination scores have not been submitted, they may be required before a student is admitted to actual candidacy for an advanced degree.

Women are admitted as graduate students on the same terms as men. Except during a summer session, however, they are not permitted to attend, either as registered students or as listeners, courses intended primarily for undergraduates.

Students of Lehigh University who are within a few hours of meeting the requirements for the bachelor's degree may, if given permission by the Graduate Faculty, enroll for a limited amount of work for graduate credit.

Registration

Graduate students will ordinarily register for courses to be taken in a fall or spring semester during the registration period given in the University Calendar. Those who find it inconvenient to present themselves during the regular registration period, how-

ever, are granted the privilege of registering during the first few days of classes. Normally such students are expected to complete their registration before the close of the third day of instruction. All students taking work in a summer session are expected to present themselves for registration on the day or days specified in the University Calendar and the Summer Session Announcement for the particular session in which they wish to enroll. Registration after the tenth day of instruction in a regular semester or the fifth day in a summer session is permitted only when the express consent of the Dean of the Graduate School has been obtained.

It should be noted that graduate work itself starts promptly at the beginning of the term, and it is frequently true that graduate courses can be given only if there is a certain minimum demand for them. Delay in enrolling for a given course may therefore cause the course to be withdrawn.

A graduate student in residence must register each semester. A graduate student who is a degree candidate in absentia must register for that semester in which he expects to complete the degree requirements.

Tuition and Fees

The tuition in the Graduate School is \$250.00 per semester or \$20.00 per semester hour, whichever amount is lower, less a discount of 20% for those professionally engaged in the field of education. The maximum full-time roster of graduate courses is 15 semester hours.

Where the major department requires a master's thesis, the student registers for the thesis and pays at the rate of the regular semester hour charge, the minimum fee being \$40.00 (less 20% for those professionally engaged in the field of education).

Graduate students in residence must register and pay a minimum tuition or dissertation fee of \$50.00 per semester.

For a doctoral dissertation prepared in absentia a reading fee of \$50.00 is charged to those graduate students who have not paid a dissertation fee of at least \$50.00 while in residence.

Part-time graduate students are given the option of paying or not paying an athletic fee of \$7.50 per semester and a student activities fee of \$3.00 per semester. If they pay these fees, they obtain the corresponding benefits.

Refunds

For University regulations concerning refunds, see page 46.

Members of the University Staff

Full-time members of the University staff may not take more than six semester hours of graduate work in any one semester; half-time members of the staff may not take more than ten semester hours. Students under contract to devote not more than one-third of their time to University employment may take a maximum of thirteen semester-hours per semester.

Filing of Application for Degree

Candidates for degrees to be conferred in June file with the Registrar, on a form provided for the purpose, on or before May 15, a written notice of their candidacy; candidates for degrees to be conferred in October file a similar notice on or before September 8. Failure to file such notice by the dates mentioned bars the candidate from receiving the degree at the ensuing graduation exercises.

Chemistry Breakage

For University regulations on breakage see page 45.

DEGREES

In addition to the general regulations set forth below, more detailed instruction for procedures may be obtained from the Office of the Graduate School.

Students desiring to qualify for graduate degrees in the minimum time should have pursued an undergraduate major in the subject equivalent to that offered at Lehigh. At the discretion of the head of the department, a limited number of credits in closely allied subjects may be accepted in lieu of courses in the undergraduate major. Those with undergraduate deficiencies who are admitted because otherwise well qualified will be expected to make up such deficiencies in addition to satisfying the minimum requirement for the degree sought.

Master of Arts and Master of Science

The master's degree is granted to properly qualified students who complete satisfactorily at least two full semesters of advanced work. In meeting the requirements for the degree, the student must comply with the following regulations:

1. Each candidate for the master's degree must submit for the approval of the Graduate Faculty the program of courses he proposes to take to satisfy the requirements. This program must have the approval of the head of the student's major department, and all courses included which are not offered by the student's major department must also be approved by the heads of the departments concerned. Approval of the program by the Graduate Faculty signifies that the student has formally been admitted to candidacy for the degree.

2. The *minimum* program for the master's degree must include:

- a. Not less than thirty semester hours of graduate work.
- b. Not less than twenty-four hours of "300" and "400" level course work of which at least eighteen hours shall be from the "400" group (see p. 133 for classification of courses).
- c. Not less than eighteen hours in the major field.
- d. Not less than fifteen hours of "400" courses in the major field.

3. The eighteen hours required in the major field are ordinarily taken in one department. Specific exceptions to this rule are mentioned in the departmental statements at the head of course listings. The remaining twelve hours of a *minimum* program, or any part of them, may also be taken in the major department; or they may be taken in any other field in which courses for graduate credit are offered, as the needs or interests of the student may indicate, subject to the approval of the head of the major department. In all cases, the work for the master's degree must be taken under at least two instructors.

4. Graduate students registered in "200" and "300" courses may be assigned additional work at the discretion of the instructor.

5. A thesis may be required by the major department. If required, the thesis shall not count for more than six semester hours.

The credit to be allowed shall be fixed by the head of the major department. Two bound typewritten copies of the thesis (one of which shall be an original copy), approved by the faculty members under whom the work was done and by the head of the major department, shall be placed in the hands of the Dean of the Graduate School at least two weeks before the day on which the degree is to be conferred. Information as to the form in which the thesis must be presented may be obtained from the Office of the Graduate School.

6. The master's degree is not granted unless the candidate has earned the grades A or B in at least eighteen hours of the work on his program and in all "300" courses in his major field. No course in which the grade earned is less than C is credited toward the degree.

7. All work which is to be credited toward a master's degree must be done in actual and regular attendance at Lehigh University.

8. All work on a program for the master's degree must be completed within a six-year period.

When all requirements have been met, the candidate is recommended by the Faculty to the trustees for the master's degree appropriate to the work pursued.

Doctor of Philosophy

The degree of Doctor of Philosophy is conferred on candidates who have demonstrated general proficiency and high attainment in a special field of knowledge and capacity to carry on independent investigation in that field as evidenced by the presentation of an acceptable dissertation embodying the results of original research. The requirements for the degree are more specifically set forth in the following regulations.

1. **TIME REQUIREMENTS.** A candidate ordinarily is expected to devote three or more academic years to resident graduate study. In no case is the degree awarded to one who has spent less than two full academic years in resident graduate work. Study for any specified period of time, however, is not in itself regarded as sufficient ground for the award of the degree.

Graduate work done in residence at other institutions will be accepted in partial fulfillment of the time requirements, provided such work is approved by the Graduate Faculty and by the departments concerned.

Work of fragmentary character scattered over a long period of years, or work completed many years before the student becomes a candidate for the degree is subject to special review by the Graduate Faculty. The extent to which such work may be credited towards the fulfillment of the time requirements will be decided by the Faculty. All work on a program for the Ph.D. degree must be completed within a ten-year period.

2. RESIDENCE REQUIREMENTS. A candidate for the degree must complete at least one full academic year of resident graduate study at Lehigh University.

3. ADMISSION TO CANDIDACY. Candidates for the doctorate are accepted in a limited number of departments only, and a department may limit the number of candidates accepted in any year. In exceptional cases new students may be admitted to candidacy immediately upon registration in the Graduate School. Ordinarily, however, they are required to spend at least one semester in residence before they are accepted as candidates. Admission to candidacy is at the discretion of the Graduate Faculty and is granted only upon written application by the student. The applicant must have the endorsement of the departments concerned. The proposed major department may require a qualifying examination. In passing upon a student's application, the Faculty will take into consideration the applicant's general education, as well as his special qualifications for work in his chosen field. Each applicant is notified by the Dean of the Graduate School, in writing, of the action of the Faculty upon his application.

The application of a foreign student must be accompanied by a statement from the department in which he intends to specialize, certifying that he has a satisfactory command of English.

At the time of admission to candidacy a special committee is appointed by the Executive Committee of the Graduate Faculty to direct the work of the candidate.

4. **PLAN OF WORK.** Preparation for the degree is based on the study of a major subject, to which one or two minors may be added. The program of work, to be formulated by the candidate, his special committee, and the head of his major department, should be planned to lead to a general mastery of the major field and to a significant grasp of any minor that may be added. The program must be approved by the Executive Committee of the Graduate Faculty.

While there is no definite requirement as to the number of courses to be taken, two years devoted to formal courses is the customary minimum. In no instance, however, is the degree awarded merely for the faithful completion of any program of courses.

5. **LANGUAGE REQUIREMENTS.** The candidate must give evidence, through examinations, of a reading knowledge, sufficient for the purposes of his special studies, of at least two foreign languages (in addition to any language which may constitute his major subject). In each case the required languages are designated by the candidate's major department and approved by the Graduate Faculty. The language requirements must be satisfied before the student presents himself for the general examination, described below.

Language examinations are in charge of a committee consisting of representatives of the language department concerned and of the candidate's major department.

Permission to take the language examinations does not imply admission to candidacy for the degree.

6. **GENERAL EXAMINATION.** The general examination for the doctorate is designed to test both the student's capacity and his proficiency in his field of study. The examination is not necessarily confined to the content of courses that have been taken at Lehigh University or elsewhere. It is held ordinarily not earlier than toward the close of the second year of work, nor later than seven months prior to the time when the candidate plans to receive the degree. The student's special committee is in charge of the examination, which may be both written and oral.

Application for admission to the general examination must be filed with the Dean of the Graduate School at least one month be-

fore the time of the examination. No student is permitted to take this examination who has not been admitted to candidacy for the doctorate or who has not satisfied the language requirements.

Should a candidate fail in the general examination, he may be permitted by the Graduate Faculty to present himself for a second examination not earlier than five months after the first. If the results of the second trial are also unsatisfactory, no further examination is set.

7. DISSERTATION. The candidate is required to present a dissertation prepared under the general direction of a professor at Lehigh University. The dissertation shall treat a topic related to the candidate's major subject, embody the results or original research, give evidence of high scholarship, and constitute a contribution to knowledge. It must be approved by the professor under whose direction it was written, by the candidate's special committee, and by the Graduate Faculty. A copy bearing the written approval of the professor in charge must be presented to the Dean of the Graduate School for transmission to the student's special committee not later than May 1 if the degree is to be conferred in June, not later than September 1, if the degree is to be conferred in October.

The candidate shall deposit with the Dean of the Graduate School, at least one week before the degree is to be conferred, (1) two typewritten copies (one an original copy) of the accepted dissertation in standard form and binding; (2) an abridgment of the dissertation in a form suitable for publication and acceptable to the candidate's special committee. At the same time he shall deposit with the Bursar of the University the sum of fifty dollars (\$50.00). This deposit will be refunded if the dissertation, or an acceptable summary including all its major results, is published within two years after the degree is awarded, in a place and form approved by the Dean of the Graduate School. Otherwise the deposit may be used by the University to defray part of the cost of printing and distributing the original abridgment. The period of two years may be extended at the discretion of the Graduate Faculty.

8. FINAL EXAMINATION. After the dissertation has been accepted by his special committee, the candidate will be examined orally by the officers of professorial rank in the departments con-

cerned and such other persons as may be selected by the candidate's special committee.

9. CONFERRING OF DEGREE IN ABSENTIA. The degree of Doctor of Philosophy will not be conferred in absentia unless the candidate is excused by the President of the University.

Postdoctoral Work

Students who have completed the requirements for the doctorate may enroll for postdoctoral individualized study under the guidance of selected members of the faculty. Such a program of study contemplates a broad educational and research development at advanced and mature levels, and provides opportunities to prepare for specific positions. A formal certification of such work as may be accomplished by the student will be made.

Miscellaneous Regulations

The normal roster of a full-time graduate student is fifteen semester hours. Larger rosters may be taken only on the specific approval of the Graduate Faculty, and such approval may be expected only under exceptional circumstances. Graduate students who are employed elsewhere and can give only part of their time to graduate work should restrict the size of their rosters accordingly.

Graduate students who hold University appointments of any kind are permitted to enroll for only a limited amount of graduate work. Full-time employees of the University may not take more than six semester hours of graduate work in any one semester; half-time employees may not take more than ten semester hours. Students under contract to devote not more than one-third of their time to University employment may take a maximum of thirteen semester hours per semester.

With the consent of the head of his major department and of the head of the department concerned, a graduate student may be admitted as a regular listener in one or more courses, which course or courses shall be outside his approved program of studies for the degree; provided that the total number of hours in which he is registered and in which he is a listener shall not exceed the limits above set forth for employees of the University. In no case shall a student who has attended a course as a listener be given an examination for credit in that course.

Description of Courses

Description of Courses

Following is a list of undergraduate and graduate courses offered by Lehigh University. For purposes of record, all approved courses are listed. It must be understood, however, that the offerings in any given semester are contingent upon a number of factors, including student needs as determined at the time of pre-registration.

Credit Hours

The number in parentheses following each course title indicates the credit value of the course in terms of semester-hours. Three hours of drawing, of work in the laboratory, or of practice in the field are regarded as the equivalent of a recitation or lecture of one hour's duration.

Course Numbering

All of the University's courses of instruction were classified and renumbered in 1950 according to the following system:

- 0-99 Undergraduate courses, primarily for underclassmen. Not available for graduate credit.
- 100-199 Advanced undergraduate courses. Not open to freshmen and sophomores except on petition. Not available for graduate credit.
- 200-299 Courses open to advanced undergraduates and graduates. Not available for graduate credit in the major field.
- 300-399 Courses open to advanced undergraduates and graduates. Available for graduate credit in the major field.
- 400-499 Courses open to graduates only.

Wherever the number of a course has been changed under the new system, the former designation follows in parentheses. A reference list of new and old numbers will be found at the back of the catalog.

Prerequisites

Prerequisites are of two kinds: primary prerequisites, which are strictly essential, and secondary prerequisites, which are highly desirable but not absolutely essential. Secondary prerequisites may be waived by the head of the department concerned. In the following descriptive paragraphs, primary prerequisites are printed in *italics* and secondary prerequisites in roman type. For all "100" courses junior standing is a primary prerequisite.

ACCOUNTING

Professors Cowin, Bratt, and Allen

Assistant Professors Koch and Kubelius

Messrs. C. L. Moore, Ondrechen, Dixon, and Woodke

ACCOUNTING

Acctg. 1. Accounting (3)

The elementary principles of accounting, with problem work to develop a knowledge of accounting method and practice. Financial statements and their preparation, analysis and recording of transactions, journalizing and posting, use of special ledgers and journals, adjusting and closing accounts. First and second semesters.

Acctg. 2. Accounting (3)

Elementary accounting problems peculiar to proprietorships, partnerships, and corporations; manufacturing enterprises; depreciation; and a more detailed consideration of financial statements than is possible in Acctg. 1. Prerequisite: *Acctg. 1*. First and second semesters.

Acctg. 104 (4). Accounting for Engineers (3)

An intensive course in the principles and practices of accounting, covering the fundamentals in one semester. Especially designed for engineering students. Prerequisite: *junior standing*. First and second semesters.

Acctg. 106 (6). Cost Accounting for Engineers (3)

A one semester course in cost finding and cost analysis, designed especially for engineering students. Cost elements, costing methods, and the use of cost data for purposes of cost control. Prerequisite: *Acctg. 2 or 104*. Second semester.

Acctg. 115. Cost Accounting (3)

The principles and methods used to determine unit costs of product or services. Material, labor, and overhead costs, methods of distributing overhead, and the application of cost principles to job order and process production. Prerequisite: *Acctg. 2 or 104*. First semester.

For Advanced Undergraduates and Graduates

Acctg. 213 (113). Intermediate Accounting (3)

Problems of the balance sheet, its form and content, the valuation of assets, liabilities, and problems relating to capital stock, surplus, and reserves. Prerequisites: *Acctg. 2 or 104*. First semester. Mr. Cowin

Acctg. 214 (114). Intermediate Accounting (3)

Problems of profit and loss statements, income, receiverships and bankruptcy, estates, and consolidated statements. Prerequisites: *Acctg. 2 or 104*; Acctg. 213. Second semester. Mr. Cowin

Acctg. 218 (118). Advanced Cost Accounting (3)

Special cost problems such as: standard costs, distribution costs, joint costs. The managerial use of cost data, control of costs, and design of cost accounting systems. Prerequisite: *Acctg. 115*. Second semester.

Mr. Koch

Acctg. 219 (119). Specialized Accounting Systems (3)

Charts of accounts and the adaptation of accounting principles to business enterprises in various industries. Prerequisite: *Acctg. 115 or 213*. First semester.

Mr. Allen

Acctg. 220 (120). Auditing (3)

The different types of audits and special investigations. Problems involving audit principles and procedure; methods of detecting and preventing fraud; the writing of audit reports; the ethics and the legal responsibilities of accountants. Prerequisites: *Acctg. 213*; Acctg. 214. Second semester.

Mr. Allen

Acctg. 271 (171). Readings in Accounting (3)

An unrostered course designed for students having special interest in some phase of accounting not covered by the rostered courses. The study may be in the history of accounting, accounting theory, municipal or public utility accounts, or any special subject approved by the instructor. Prerequisites: *senior standing, 12 credit hours in accounting, and consent of the head of the department*. First semester.

Messrs. Allen, Cowin, Koch

Acctg. 272 (172). Readings in Accounting (3)

Continuation of Acctg. 271. Prerequisites: *senior standing, 12 credit hours in accounting, and consent of the head of the department*. Second semester.

Messrs. Allen, Cowin, Koch

ECONOMIC STATISTICS

E.S. 145. Statistical Method (3)

The methods of statistical description and induction, including tabular and graphic analysis and presentation. Prerequisite: *Eco. 104*. First semester.

Mr. Bratt

For Advanced Undergraduates and Graduates

E.S. 246 (146). Business Cycles and Forecasting (3)

The nature of the business cycle and the application of statistics to business trends, with special attention to forecasting and business barometers. Prerequisite: *E.S. 145*. Second semester. Mr. Bratt

E.S. 247 (147). National Income Analysis (3)

Analysis of income and product aggregates from the point of view of development and structural breakdown, emphasizing sector accounts, saving and investment. Prerequisite: *E.S. 246*. First semester. Mr. Bratt

E.S. 248 (148). Advanced Business Cycles (3)

Recent business cycle theories; the evolution of the theories, and the problems of economic change which the theories attempt to explain. Prerequisite: *E.S. 246*. Second semester. Mr. Bratt

E.S. 252 (152). Advanced Statistical Method (3)

Sampling and correlation methods employed in industry and government. Prerequisite: *E.S. 145 or approved equivalent*. Second semester. Mr. Bratt

E.S. 271 (171). Readings in Economic Statistics (3)

An unrostered course designed for students with special interests in some field of economic change or economic forecasting. Prerequisite: *E.S. 246 and consent of the head of the department*. First semester. Mr. Bratt

E.S. 272 (172). Readings in Economic Statistics (3)

Continuation of *E.S. 271*. Prerequisite: *E.S. 246 and consent of the head of the department*. Second semester. Mr. Bratt

LAW

Law 101 (1). Business Law (3)

The law of contracts and bankruptcy, agency bailments and sales. First semester.

Law 102 (2). Business Law (3)

The law of negotiable instruments, partnership, corporations, real property, insurance, and security devices. Prerequisite: *Law 101*. Second semester.

Law 103. Federal Tax Law (3)

The most recent revenue acts; procedure in using the law and regulations to determine the amount of the tax liability for individuals, partnerships, trusts, and corporations. Prerequisite: *Acctg. 2 or 104*. First semester.

BIOLOGY

ASTRONOMY

See Mathematics and Astronomy

ATHLETICS

See Division of Athletics and Physical Education

A reference list of new and old numbers will be found at the back of the catalog.

BIOLOGY

Professors S. J. Thomas and Trembley

Associate Professors Parker, Owen, and Grainger

Mr. Ritter

Biol. 1. Biology (3)

General distribution requirement for arts students who do not intend to major in biology. A general course in biological types and principles. Two lectures and one laboratory period per week. First semester.

Biol. 3. Comparative Vertebrate Anatomy (3)

A course in vertebrate zoology with emphasis on the study of homologous body structures in the various vertebrate classes and their relationship to the functional demands of habit and environment in each class. Detailed dissections of representative vertebrates are made in the laboratory. One lecture and two laboratory periods each week. Prerequisites: *Biol. 31 and 32, or the equivalent.* First semester.

Biol. 4. Vertebrate Embryology (3)

A study of reproduction from germ cell formation through establishment of the principal organ systems of the vertebrate body. Various mechanical and physiological problems confronting the growing embryo are considered, and direct observations of whole-mounts, sections and living material are made in the laboratory. Two lectures and one laboratory period each week. Prerequisites: *Biol. 31 and 32, or the equivalent; Biol. 3.* Second semester.

Biol. 6. Botany (3)

Fundamentals of the morphology and physiology of plants. The evolutionary development of the plant kingdom. Two lectures and one laboratory period per week. Field trips in the spring. Second semester.

Biol. 13. Human Biology (3)

A lecture course in biological principles as illustrated by man. Man in relation to his environment, the organ systems of man, population biology, parasitism, elements of human inheritance and human evolution. First and second semesters.

Biol. 15. Freshman Hygiene

Four lectures on social hygiene, with the cooperation of the director of the students' health service. Given during freshman week. Required of all non-veteran freshmen. Either this course or Biol. 16 must be passed before graduation.

Biol. 16. Social Hygiene

For non-veteran students who have not passed Biol. 15. Second semester.

Biol. 18. Genetics (2)

A study of the basic laws governing inheritance in plants and animals, chromosome behaviour, nature of genes. The relation of environmental modifications, hybrid variation, and mutations to the mechanics of evolution. Prerequisites: Biol. 31, 32, or the equivalent. Second semester.

Biol. 31. Zoology (3)

A foundation course for majors in biology. Living things are studied from a functional rather than a purely morphological viewpoint. Protoplasm, cellular metabolism, reproduction, and other fundamental conceptions of life-processes. Lectures and laboratory. First semester.

Biol. 32. Zoology (3)

A continuation of Biol. 31. Second semester.

Biol. 33. Biology and Organic Evolution (3)

A lecture and recitation course in animal biology with special reference to man. A survey of the lower forms of life and their evolution; the biology of the individual and of populations; genetics and human evolution. First semester.

Biol. 34. Biology and Organic Evolution (3)

A continuation of Biol. 33. Second semester.

Biol. 36. Economic Botany (3)

Economic products of plant origin from the point of view of their development, structural characteristics, uses, and sources. Two recitations and one laboratory period per week. First semester.

Biol. 50. Sanitary Bacteriology (3)

Study of bacteria and allied microorganisms by staining and cultural methods; their sanitary importance in public water supplies; the bacteriology of sewage and sewage treatment; qualitative and quantitative bacteriological and biological analysis of water, milk, and sewage. Lectures, recitations, and laboratory. Second semester.

Biol. 52. Bacteriology (3)

Elementary general bacteriology. The morphological and cultural characteristics of bacteria and allied microorganisms; special attention to forms of sanitary and economic importance; the role of bacteria, yeasts, and molds in fermentation industries, in water and milk. Lectures, recitations, and laboratory. First semester.

Biol. 61. Bacteriology (3)

An elementary course for students specializing in biological sciences. Special staining methods in the study of morphology; differential media in bacterial physiology; thorough study of staining, cultural and biochemical properties of the microorganisms themselves rather than their specific sanitary or industrial importance. Recitations, lectures, and laboratory work. First semester.

Biol. 62. Bacteriology (3)

Continuation of Biol. 61.

Biol. 120 (20). Physiology (3)

Recitations and demonstrations covering the principles underlying the operation of life-processes. The subject matter is not limited to any one group of organisms, but is derived from living things in general. Prerequisites: Biol. 31, 32; Chem. 150; Phys. 12, 16, 17. Second semester.

For Advanced Undergraduates and Graduates

Biol. 206 (106). Natural History and Ecology (3)

Identification and life habits of local plants and animals; laboratory training in the use of analytical keys and of collections of reference, and the correct methods of making collections; trips to local regions of natural interest for field identification and study of interrelationships of living organisms; conservation, conservation programs, and appreciation of nature. Three lectures, one laboratory, and one field trip a week. Not available as part of a graduate major in biology. Mr. Trembley

Biol. 313 (113). Histology (3)

The techniques of preservation and preparation of animal tissues for microscopical study; comparative studies of fresh and preserved vertebrate tissues. One lecture and two laboratory periods per week. Prerequisite: Biol. 31 or its equivalent. Second semester. Mr. Owen

Biol. 353 (153). Advanced Bacteriology (3)

A continuation course for students majoring in bacteriology. A laboratory and recitation course in the study of bacterial species. The morphological, cultural and biochemical characteristics of a few species are studied in detail. Prerequisite: *Biol. 61 or equivalent*. Second semester.

Messrs. Grainger, Thomas

Biol. 355 (155). Industrial Bacteriology (3)

An advanced laboratory course in bacteriology including aspects of industrial chemistry in which bacteria play an essential part in the process, as in the manufacture of acetone, butanol, acetic, and lactic acids. Prerequisites: at least two years of chemistry, including quantitative analysis; Biol. 52 or 61. Second semester.

Messrs. Parker, Thomas

Biol. 358 (158). Immunology (3)

A comprehensive recitation course in the study of the antigen-antibody reaction as a broad biological phenomenon. Emphasis is laid on the fundamental response of the tissue cell to foreign substances rather than on any medical application. Prerequisite: Biol. 353. First semester.

Mr. Thomas

Biol. 361 (161). Public Sanitation (3)

A laboratory and field study of the biological, chemical, bacteriological, and physical aspects of public water supplies, systems of sewage disposal, and milk distribution. Prerequisites: at least two years of chemistry, including quantitative analysis; Biol. 50, 52, or 61. First semester.

Mr. Thomas

For Graduates

Prerequisite for graduate work in biology: the amount of biology usually required for an undergraduate major in that department. Prerequisite for graduate work in bacteriology: a satisfactory undergraduate course in bacteriology and sufficient preparation in organic chemistry. Ability to undertake graduate work must be demonstrated by previous scholastic record, an examination, or both.

Biol. 403 (203). Vertebrate Histogenesis and Organogenesis (3)

Careful laboratory work on the development of a vertebrate; tracing of the history of the germ-layers, organs, and tissues; the association of tissues to form organs. First semester.

Mr. Owen

Biol. 407 (207). Biological Research (3)

Investigations in any phase of the biological sciences according to the student's preparation and interests. First semester.

Messrs. Grainger, Owen, Parker, Thomas, Trembley

Biol. 408 (208). Biological Research (3)

Continuation of Biol. 407. Second semester.

Messrs. Grainger, Owen, Parker, Thomas, Trembley

Biol. 409 (209). Advanced Morphology (3)

A laboratory course in special phases of morphology, such as comparative osteology, comparative morphology, or embryology of the invertebrates, etc., to meet the individual interest of the student. First or second semester.

Mr. Owen

Biol. 410 (210). Biological Theories (3)

An advanced course in genetics and evolution. First semester.

Messrs. Thomas, Trembley

Biol. 411 (211). General Cytology (3)

Conference, assigned readings, and laboratory work on the structural features of the cell in relation to cellular function and on modern methods of preparing living and fixed tissues for cytological study. Prerequisite: *Biol. 313 or equivalent*. First or second semester.

Mr. Owen

Biol. 412 (212). Field Zoology (3)

Methods of biological survey work; animal censuses; collection, preparation, and care of zoological specimens; the use of keys; study of the interrelationships existing between the groups of local animals, especially the vertebrates, and of their habitat preferences. Lectures, laboratory work, and field trips. Second semester.

Mr. Trembley

Biol. 413 (213). Problems in Field Zoology (3)

Concentrated work in the life history study of one or more local species. To be taken concurrently with or following Biol. 412, depending upon the previous experience and interest of each student. First or second semester.

Mr. Trembley

Biol. 430 (230). Antibiotic Substances (3)

Fundamentals of the interrelationships among microbial populations; preparation and evaluation of penicillin and similar substances. Two lectures and one laboratory period per week. Prerequisites: *Biol. 61, Chem. 150, or their equivalents*. Second semester.

Mr. Parker

Biol. 456 (256). Industrial Mycology (3)

An advanced laboratory course in mycology, including aspects of industrial chemistry in which yeasts and molds play an essential part in the process, such as in the manufacture of industrial alcohol, citric acid, etc. Prerequisite: Biol. 355 or equivalent. Second semester.

Mr. Parker

Biol. 460 (260). Serology (3)

A laboratory course in the preparation of antigens, immunization of animals, and the study of antigen-antibody reactions. To be taken concurrently with or following Biol. 358. First or second semester.

Mr. Thomas

Biol. 462 (262). Microbiology (3)

A recitation and laboratory course in the study of the higher bacteria, yeasts, molds, algae, and protozoa of interest to the bacteriologist. Practical applications to sanitary bacteriology, water supplies, sewage disposal systems and food spoilage. First or second semester. Mr. Parker

Biol. 463 (263). Physiology and Chemistry of Bacteria

The biochemistry of bacterial metabolism, zymology, respiration, nutrition, reproduction. First or second semester. Messrs. Grainger, Thomas

Biol. 464 (264). Epidemiology (3)

A seminar dealing with historic epidemics of typhoids, cholera, plague, diphtheria, and the venereal diseases; the methods of transmission of the organisms concerned with mass infections; modern immunological and sanitary practice in prevention. First or second semester. Mr. Grainger

Biol. 465 (265). Industrial Biology (3)

A laboratory course in the preparation and standardization of biological products used in active immunization, diagnosis, and serum therapy. Prerequisites: Biol. 358. First or second semester.

Messrs. Grainger, Thomas

Biol. 466 (266). Public Health Administration (3)

The organization of national, state, and local health services; relationship between official and volunteer health agencies; functions of medical health officer, epidemiologist, public health nurse, and sanitary inspectors in a public health program; various phases of health work such as eugenics, personal, social and industrial hygiene, sanitation, vital statistics, and public education. First or second semester. Mr. Thomas

Biol. 467 (267). History of Bacteriology (3)

Reading, conferences, and written reports. First or second semester.

Mr. Thomas

Biol. 468 (268). History of Biology (3)

Reading, conferences, and written reports. First or second semester.

Mr. Trembley

BUSINESS ADMINISTRATION

See Accounting, Economics and Sociology, and Finance

A reference list of new and old numbers will be found at the back of the catalog.

CHEMISTRY AND CHEMICAL ENGINEERING

Professors Neville, W. W. Ewing, Theis, Simmons, Anderson, Serfass,
Amstutz, D. E. Mack, and Zettlemoyer

Associate Professors Billinger, and Fornoff

Assistant Professors Easton, Fish, O'Hara, and Rhoda

Messrs. Healey, Muraca, Uhl, Steinhardt, Blanken, Buralli, Collier,
Danes, Finkler, Gardner, Herty, Rowe, Rubright, Storow,
Surash, Taylor, Way, White, Zitzman.

CHEMISTRY

Chem. 4. General Chemistry (4)

The principles and applications of general chemistry; descriptive chemistry of the non-metals and their important compounds. One demonstration lecture, two recitations, one laboratory period. First and second semesters.

Chem. 5. General Chemistry (4)

Continuation of Chem. 4. Principles and applications of general chemistry; descriptive chemistry of the metals and their compounds. One demonstration lecture, two recitations, one laboratory period. Prerequisite: *Chem. 4*. First and second semesters.

Chem. 15. Elementary Chemistry (3)

An abridgment of Chem. 4. For students not majoring in science or engineering. Two lecture-recitations, one laboratory period. First semester.

Chem. 16. Elementary Chemistry (3)

Continuation of Chem. 15; an abridgment of Chem. 5. Two lecture-recitations, one laboratory period. Prerequisite: *Chem. 15 or Chem. 4*. Second semester.

Chem. 35. Analytical Chemistry (4)

Theory and practice of qualitative and quantitative analysis. Qualitative analysis by semi-micro methods; gravimetric and volumetric quantitative procedures. One lecture, three laboratory periods. Prerequisites: *Chem. 4 and 5*. First semester.

Chem. 36. Analytical Chemistry (4)

Continuation of Chem. 35. Volumetric precipitation procedures; oxidation-reduction titrations; electrolytic and electrometric methods of analysis. One lecture, three laboratory periods. Prerequisites: *Chem. 4 and 5*; *Chem. 35*. Second semester.

Chem. 38. Analytical Chemistry (3)

An abridgment of Chem. 35 for mining and metallurgical engineers. One lecture, two laboratory periods. Prerequisites: *Chem. 4 and 5*. First semester.

Chem. 91. Physical Chemistry (3)

Introduction to physical chemistry; states of matter, change of state, solutions, surface phenomena; nuclear, atomic, and molecular structure. Prerequisites: *Chem. 4 and 5; Math. 13 previously or concurrently*. First semester.

Chem. 92. Physical Chemistry Laboratory (1)

Physical chemical measurements. To accompany Chem. 91. Prerequisites: *Chem. 35 or 38; Phys. 22; Math. 13 previously or concurrently*. First semester.

Chem. 93. Elements of Physical Chemistry (3)

Kinetic theory, change of state, solutions, equilibria, electrochemistry, colloidal phenomena. Especially designed for biology majors. Prerequisites: *Chem. 4 and 5*. First semester.

Chem. 100. Industrial Employment

During the summer following the junior year candidates for the degree of B.S. in Chemistry are required to obtain industrial experience through employment for at least eight weeks in a plant or laboratory. Proposed employment must be approved in advance by the Director of the Curriculum, and a report covering this experience must be presented to him on or before the following January 8.

Chem. 150. Organic Chemistry (3)

Systematic survey of the typical compounds of carbon, their classification and general relations; study of synthetic reactions. Prerequisites: *Chem. 5 and 35*. First semester.

Mr. Easton

Chem. 151. Organic Chemistry (3)

Continuation of Chem. 150. Prerequisite: Chem. 150. Second semester.

Mr. Amstutz

Chem. 165. Organic Chemistry Laboratory (2)

Preparation of pure organic compounds. Prerequisites: *Chem. 5; Chem. 35*. First semester.

Messrs. Amstutz, Easton, Fish

Chem. 167. Organic Chemistry Laboratory (2)

Continuation of Chem. 165 with particular emphasis upon aromatic compounds. Prerequisite: Chem. 165. Second semester.

Messrs. Amstutz, Easton, Fish

Chem. 175 (97). Research Chemistry Laboratory (3)

Advanced study or an investigation involving intensive work in laboratory and library. Topics in active research include adsorption, analytical processes, drying oils, engineering processes, heterocyclic organic compounds, hydration of inorganic salts, kinetics of combustion, photomi-

crography, natural and synthetic resins, pigments, aldol syntheses, plastics, surface chemistry, tanning and leather technology, and X-ray technique. Second semester. Staff

Chem. 179. History and Literature of Chemistry (1)

Chronological development of the science with assigned reading. Survey of reference books and journals. Second semester. Mr. Billinger

Chem. 190. Physical Chemistry (3)

Continuation of Chem. 91. Study of the laws of thermochemistry, solutions, rates of reaction, and chemical equilibrium in homogeneous and heterogeneous systems based on thermodynamic and kinetic concepts. Prerequisites: *Math. 13, Phys. 23 and 24, or 16 and 17; Math. 14, Chem. 91.* Second semester. Messrs. Ewing, Zettlemoyer

Chem. 192. Physical Chemistry Laboratory (1)

Continuation of Chem. 92. Prerequisites: *Chem. 91, Phys. 23; Chem. 2.* Second semester. Messrs. Ewing, Healey

Chem. 194. Physical Chemistry and Electrochemistry (3)

Continuation of Chem. 190. The laws of conductivity, current electromotive force and energy relations of electrolytes in solutions and in the molten state. Prerequisites: *Math. 13, Phys. 23 and 24, or 16 and 17; Math. 14, Chem. 190.* First semester. Mr. Ewing

Chem. 197. Electrochemistry Laboratory (1)

Experimental study of electrochemical reactions. Measurements of conductivity, current and electromotive force. Prerequisites: *Math. 13, Chem. 35 or 38, Phys. 23 and 24, or 16 and 17; Math. 14, Chem. 190.* First semester. Messrs. Ewing, Healey

For Advanced Undergraduates and Graduates

Chem. 302 (102). Inorganic Chemistry (3)

Introductory consideration of chemical bonding; family relationships among the elements; systematic survey of inorganic chemical compounds, their occurrence, properties, and reactions. Prerequisites: eight hours of general chemistry. Second semester. Mr. Fornoff

Chem. 334 (134). Radiation Methods (2)

The application of radiation methods, mainly X-ray methods, to chemical and industrial chemical problems. First semester. Mr. Anderson

Chem. 335 (135). Radiation Methods (2)

Continuation of Chem. 334. Amplification of X-ray diffraction methods; space groups; crystal chemistry. Prerequisite: Chem. 334. Second semester. Mr. Anderson

Chem. 337 (137). Advanced Analytical Chemistry (3)

One conference and two laboratory periods per week. Prerequisite: eight hours of analytical chemistry. Second semester. Mr. Serfass

Chem. 339 (139). Advanced Analytical Chemistry (2)

Similar to Chem. 337. Lecture and conference only. Prerequisite: eight hours of analytical chemistry. Mr. Serfass

Chem. 344 (144). Radiation Methods Laboratory (1)

Laboratory in connection with Chem. 334. First semester. Mr. Anderson

Chem. 345 (145). Radiation Methods Laboratory (1)

Continuation of Chem. 344. Prerequisite: Chem. 344. Second semester. Mr. Anderson

Chem. 356 (156). Quantitative Organic Analysis (1)

The practice of the common analytical procedures involving the quantitative estimation of carbon, hydrogen, halogen, nitrogen and sulfur; the iodine number method; the hydroxyl value; the acid value, and the saponification number. One laboratory period per week. Prerequisites: eight hours of analytical chemistry; a course in organic chemistry. Second semester. Mr. Fish

Chem. 357 (157). Qualitative Organic Analysis (3)

The theory and practice of the identification of pure organic compounds; preparation of derivatives and separation of mixtures of organic compounds. One lecture and two laboratory periods per week. Prerequisite: one year of organic chemistry. First semester. Mr. Easton

Chem. 358 (158). Advanced Organic Chemistry (3)

The study of modern theories of reaction mechanisms and their application to the problems of organic chemistry. Prerequisite: one year of organic chemistry. Second semester. Mr. Amstutz

Chem. 368 (168). Advanced Organic Laboratory (2)

The synthesis and study of organic compounds. Prerequisite: one year of organic chemistry. First or second semester. Messrs. Amstutz, Easton

Chem. 371 (171). Elements of Biochemistry (3)

An introduction to the study of carbohydrates, proteins, lipids, minerals and other substances and their importance in life processes. Prerequisite: one year of organic chemistry. Second semester. Mr. Fish

For Graduates

The prerequisites for graduate work in chemistry as a major study toward the doctorate or the master's degree are: inorganic or general chemistry (8), analytical chemistry (8), organic chemistry (10), physical chemistry (8), physics (12), and mathematics, including calculus. Students of exceptional ability may be able to make up minor deficiencies while carrying graduate work. If the deficiencies are serious, a student can hardly expect to complete the requirements for the master's degree within the minimum time.

Graduate students may choose either chemistry or chemical engineering as the major subject. If chemical engineering is the major subject, a number of courses in chemistry, adapted to the needs of the student, will be taken as collateral work. Other subjects may be chosen in related fields, usually physics and mathematics. Men majoring in chemistry will take collateral work in science, or such other fields as may be suited to their objectives.

Chem. 400 (200). Inorganic Chemistry Research (4)

Investigations in the field of inorganic and colloid chemistry.
Messrs. Fornoff, Neville

Chem. 401 (201). Inorganic Chemistry Research (4)

Continuation of Chem. 400. Second semester. Messrs. Fornoff, Neville

Chem. 402 (202). Advanced Inorganic Chemistry (3)

Atomic structure and theories of valence; acid-base theories; study of the properties and reactions of certain elements, with emphasis on recent developments. First semester. Mr. Fornoff

Chem. 403 (203). Advanced Inorganic Chemistry (3)

Continuation of Chem. 402. Second semester. Mr. Fornoff

Chem. 430 (230). Quantitative Analysis Research (4)

Investigation of problems in analytic procedures. First semester.
Mr. Serfass

Chem. 431 (231). Quantitative Analysis Research (4)

Continuation of Chem. 430. Second semester.

Mr. Serfass

Chem. 432 (232). Advanced Analytical Chemistry (3)

Theory of precipitation analysis; physico-chemical methods; micro-analysis; chromatography; organic-analytical reagents; accuracy and precision in analysis. Prerequisite: eight hours of analytical chemistry. Second semester.

Mr. Serfass

Chem. 433. Advanced Topics in Analytical Chemistry (3)

The theory of modern physico-chemical analytical techniques; discussion of optical and electrical instruments for use in research, including mass spectrometry, Raman spectrometry, infrared and ultraviolet spectrometry, electrometric titrations, polarography, radio-chemical instruments, etc.

Mr. Serfass

Chem. 436 (236). X-ray Research (3)

The investigation of chemical and industrial problems by X-ray diffraction methods. First semester.

Mr. Anderson

Chem. 437 (237). X-ray Research (3)

Continuation of Chem. 436. Second semester.

Mr. Anderson

Chem. 440 (220). Advanced Physical Chemistry (3)

Definitions and fundamental laws of thermodynamics; statistical thermodynamics; chemical equilibria in homogeneous and heterogeneous systems; colligative and partial molal properties of solutions; electrochemistry of solutions. Prerequisite: one year of physical chemistry. First semester.

Messrs. Ewing, Healey

Chem. 441 (221). Advanced Physical Chemistry (3)

Kinetic theory of gases, liquids, and solutions; reaction rate theory; heterogeneous reactions and catalysis; properties of dispersed systems; phenomena of surface chemistry; preparation and general properties of colloidal systems. Prerequisite: one year of physical chemistry. Second semester.

Mr. Zettlemoyer

Chem. 449 (249). Seminar in Analytical and Physical Chemistry (1)

Reports and discussions of recent developments in analytical and physical chemistry.

Messrs. Ewing, Serfass, Zettlemoyer

Chem. 452 (252). Organic Chemistry, Heterocyclic Compounds (3)

The chemistry of thiophene, pyrrole, furan, pyridine, and their derivatives, considered from the viewpoint of recent organic theories of structure and reaction mechanisms.

Mr. Amstutz

Chem. 458 (258). Topics in Organic Chemistry (3)

An intensive study of some special fields of organic chemistry.

Messrs. Amstutz, Easton

Chem. 459 (259). Seminar in Organic Chemistry (1)

Reports and discussions of recent important developments in theoretical and applied organic chemistry.

Messrs. Amstutz, Easton

Chem. 460 (260). Organic Chemistry Research (4)

Investigation of a problem in organic chemistry. First semester.

Messrs. Amstutz, Easton, Fish

Chem. 461 (261). Organic Chemistry Research (4)

Continuation of Chem. 460. Second semester.

Messrs. Amstutz, Easton, Fish

Chem. 463 (263). Physical Organic Chemistry (3)

A study of the fundamental properties of organic molecules, including quantum-mechanical resonance, spectroscopy, dipole moments and thermodynamics; the use of these physical measurements in the solution of problems in organic chemistry.

Mr. Zettlemoyer

Chem. 466 (266). Advanced Organic Preparations (2)

A laboratory course of instruction in advanced techniques of the preparation of organic compounds. First or second semester.

Messrs. Amstutz, Easton

Chem. 471 (271). The Chemistry of the Proteins (3)

A study of the proteins, amino acid, and nucleic acids, their properties, composition, degradation products, oxidation and other chemical reactions, synthesis, and analysis.

Mr. Theis

Chem. 472 (272). The Chemistry of the Carbohydrates (3)

A study of the simple and complex sugars, starches, and cellulose, their synthesis, analysis, reactions, biological relations, occurrence, and industrial applications.

Mr. Theis

Chem. 473 (273). Seminar in the Chemistry of Leather (1)

Reports and discussions of principles of protein chemistry and tanning processes as related to the production of leather.

Mr. Theis

Chem. 490 (290). Physical Chemistry Research (4)

Investigation of a problem in physical chemistry. First semester.

Messrs. Ewing, Zettlemoyer

Chem. 491 (291). Physical Chemistry Research (4)

Continuation of Chem. 490. Second semester.

Messrs. Ewing, Zettlemoyer

Chem. 493 (293). Theoretical Chemistry, Kinetics (3)

Kinetics of explosions of solids; combustion and explosion of hydrogen and hydrocarbons; polymerization; kinetics of organic reactions. Prerequisite: Chem. 441. Mr. Zettlemoyer

Chem. 495 (295). Theoretical Chemistry, Thermodynamics (3)

Statistical theory of thermodynamics; heat capacity equations; quantum theory in chemical thermodynamics. Reports and discussions on selected topics. Prerequisite: Chem. 440. Mr. Healey

Chem. 497 (297). Surface Chemistry (3)

Applications of colloid chemistry; special topics in surface chemistry. Lectures and seminar. Prerequisite: Chem. 441. Mr. Neville

Chem. 498 (298). Advanced Physical Chemistry Seminar (3)

An intensive study of some field of physical chemistry. Messrs. Ewing, Zettlemoyer

Chem. 499 (299). Physical Chemistry Methods (2)

An advanced course in methods of physical chemistry laboratory practice. Mr. Ewing

CHEMICAL ENGINEERING

Ch.E. 100. Industrial Employment

During the summer following the junior year candidates for the degree of B.S. in Chemical Engineering are required to obtain industrial experience through employment for at least eight weeks in a plant or laboratory. Proposed employment must be approved in advance by the Director of the Curriculum, and a report covering this experience must be presented to him on or before the following January 8.

Ch.E. 160 (80). Industrial and Engineering Chemistry (3)

Introduction to chemical engineering principles through a study of unit operations and processes in various chemical industries. Prerequisites: Chem. 36; Math. 14. Second semester. Mr. Simmons

Ch.E. 170 (70). Industrial Stoichiometry (3)

Chemical and physical calculations applied to industrial processes involving energy and material balances, vaporization and condensation, solubility and crystallization, fuels and combustion. Prerequisites: Math. 13; Chem. 36. First semester. Staff

Ch.E. 171 (78). Unit Operations (3)

Principals of chemical engineering related to fluid flow, heat transfer and evaporation. Prerequisites: *Math. 13*; *Math. 14*; *Chem. 36*. First semester. Messrs. Mack, Uhl

Ch.E. 172 (79). Unit Operations (3)

A continuation of Ch.E. 171, including materials handling, disintegration and separation. Two lectures and one laboratory period weekly. Prerequisites: *Math. 14*; *Chem. 91*; *Ch.E. 170, 171*. Second semester.

Messrs. O'Hara, Uhl

Ch. E. 173 (180). Unit Operations (3)

A continuation of Ch.E. 172, including the diffusional processes of drying, distillation, gas absorption, extraction. Two lectures and one laboratory period weekly. Prerequisites: *Ch.E. 171*; *Ch.E. 172*; *Chem. 91, 151*. First semester.

Messrs. Simmons, Uhl

Ch.E. 174 (181). Plant and Equipment Design (3)

A study of codes and specifications, safety and fire protection, water supply, transportation, service facilities and other factors affecting the location and layout of plants and the design of process equipment. Prerequisites: *Ch.E. 172*; *Ch.E. 173*. Second semester.

Messrs. Simmons, Uhl

Ch.E. 175 (185). Chemical Engineering Practice (1)

Comprehensive studies in nearby manufacturing plants of processes involving one or more unit operations. Prerequisite: *Ch.E. 173*. Second semester.

Messrs. Simmons, Uhl

Ch.E. 176 (Chem. 99). Chemical Engineering Projects (2)

Special study of a particular problem involving laboratory and library work. Topics include equipment design, construction and testing; research in unit operations, unit processes, thermodynamics and kinetics; data correlation. Weekly conferences and reports. Second semester.

Staff

For Advanced Undergraduates and Graduates

Ch.E. 300 (186). Chemical Engineering Thermodynamics (3)

Principles of thermodynamics as applied to chemical engineering. Consideration of flow and non-flow processes; use of calorimetric and P-V-T data as well as equations of state and generalized relationships to evaluate effect of temperature and pressure on thermodynamic properties of ideal and actual fluids. Use of thermodynamics to predict physical and chemical equilibrium. Prerequisites: basic courses in physical chemistry and chemical engineering. First semester.

Messrs. O'Hara, Mack

Ch.E. 301 (183). Process Design (3)

Technical and economic study of selected or proposed chemical processes. Flow diagrams, heat and energy balances, apparatus design, cost estimation; approximation methods for obtaining data. Lectures, discussions, comprehensive reports. The annual Chemical Engineering Contest Problem may be used as a part of the course requirements. Prerequisites: basic courses in organic chemistry and chemical engineering. Second semester.
Messrs. Mack, O'Hara

Ch.E. 302. Chemical Engineering Kinetics (3)

The application of chemical kinetics to the design and operation of reactors. Interrelations of kinetics, thermodynamics and unit operations in steady and unsteady states. Prerequisites: Ch.E. 300 or equivalent; basic courses in chemical engineering. Second semester.
Mr. O'Hara

For Graduates

Ch.E. 480 (280). Industrial Chemistry and Chemical Engineering Research (4)

Investigation of a problem in chemical engineering or in industrial chemistry. First semester.
Messrs. Mack, Serfass, Simmons, O'Hara

Ch.E. 481 (281). Industrial Chemistry and Chemical Engineering Research (4)

Continuation of Ch.E. 480. Second semester.
Messrs. Mack, Serfass, Simmons, O'Hara

Ch.E. 482 (282). Chemical Engineering (3)

Advanced consideration of chemical engineering energetics, hydrodynamics and heat transfer applied to filtration, classification, and extraction. First semester.
Mr. Simmons

Ch.E. 483 (283). Chemical Engineering (3)

Continuation and amplification of Ch.E. 482. Studies in evaporation, refrigeration, and crystallization. Second semester.
Mr. Simmons

Ch.E. 484 (284). Chemical Engineering (3)

Continuation and amplification of Ch.E. 482 and 483. Studies in absorption and distillation. Given in alternate years. First semester.
Mr. Mack

Ch.E. 485 (285). Chemical Engineering (3)

Continuation and amplification of Ch.E. 482 and 483. Studies in combustion, drying, hygrometry, and air conditioning. Given in alternate years. Second semester.
Mr. Simmons

Ch.E. 486 (286). Chemical Engineering Process Control (3)

A study of the fundamentals of primary sensing elements and their application to the measurement, recording, and control of temperature, pressure, concentration, humidity, fluid flow rate, and other variables; discussion of telemetering systems, electronic and mechanical recording systems, pneumatic and electromechanical indicating and controlling elements. Second semester. Mr. Serfass

Ch.E. 488 (288). Chemical Engineering Process Design (3)

The application of chemical engineering principles in the design of unit process equipment, involving such processes as evaporation, distillation, drying, filtration, and absorption and the coordination of such units into organized production. Messrs. Mack, Simmons

Ch.E. 489 (289). Chemical Engineering Process Design (3)

Continuation of Ch.E. 488.

Messrs. Mack, Simmons

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CIVIL ENGINEERING & MECHANICS

Professors Eney, Sutherland, and C. D. Jensen

Associate Professors Fuller, Beer, and West

Assistant Professors Kleinschmidt, Kolm, P. F. Miller, McPherson, Loewer, Crispin, Liebig, Muhlhausen, E. R. Johnston, Snyder, Tör

Messrs. Beedle, Ashley, de Neufville, Jacobsen, Strausser, Nece,

• Errera, Young, Costa, Driscoll, Eagleson, Gigliotti,

Jentoft, Smislova, Kaminsky

CIVIL ENGINEERING

C.E. 40 (6a). Land and Topographic Surveying (3)

The theory and practice of land surveying, including computation of areas, dividing land, map drawing, and topographic signs; field work with level and transit; theory and use of stadia. A recitation and seven hours of field work each week-day for three weeks. Prerequisites: *plane trigonometry*. C.E. 61. Summer session.

C.E. 41 (31a). Route Surveying (3)

Reconnaissance, preliminary and location surveys; theory and practice concerning simple, spiral, and vertical curves; railway switches; establishment of grades and setting of slope stakes; mass diagrams. Prerequisite: C.E. 40. Summer session 1951 and thereafter.

C.E. 42 (16). Highway Engineering (3)

The location, construction, and maintenance of roads and pavements; highway design. Prerequisite: C.E. 40. Second semester 1950-51, first semester thereafter.

C.E. 43 (35). Advanced Surveying (3)

Adjustment of instruments; investigation of systematic and observational errors; elements of least squares with application to surveying adjustment of level nets and triangulation; solar and polar observations; field work in triangulation, determination of azimuth, precise leveling, and with the plane table; brief treatment of mine surveying and photogrammetry. Prerequisite: C.E. 40. Second semester 1951-52 and thereafter.

C.E. 60 (2a). Engineering Drawing (1)

A brief course in the elements of descriptive geometry designed for those students who pass an anticipatory examination in engineering drawing (excluding descriptive geometry), but who require credit for C.E. 61 according to the terms of their programs.

C.E. 61 (3). Engineering Drawing and Descriptive Geometry (3)

The use of drawing instruments; instruction in engineering lettering; the theory and practice of mechanical drawing and descriptive geometry; complete working and assembly drawings; tracing and reproduction of drawings; intersections and developments. The student who presents evidence of training in engineering drawing may take an anticipatory examination (excluding descriptive geometry) and receive two semester hours credit, if successful in passing the examination. See C.E. 60. First and second semesters.

C.E. 100 (29). Industrial Employment

During the summer following the junior year, students are required to spend at least eight weeks in approved shop work or on engineering construction. A written report on the shop work or project, outlining the experience obtained is due on return from Christmas recess. The reports should contain plans, photographs, or calculations, as each case may require.

C.E. 101. Foundations (2)

Design and construction of foundations for bridges and buildings. Prerequisites: *Mech. 111*; *Geol. 6*. Second semester.

C.E. 102 (41a). Civil Engineering Pro-Seminar (1)

A study of current civil engineering projects and developments with written reports. At weekly meetings these reports are presented orally in abstract. Prerequisite: senior standing.

C.E. 103 (113). Special Problems (2-4)

Supervised individual research problems with report. First or second semester.
Messrs. Eney, Jensen, Loewer, Johnston

C.E. 104 (110). Readings in Civil Engineering (1-3)

Study of selected technical papers with abstracts and reports.

C.E. 105 (100). Engineering Valuation and Economy (3)

The determination of probable life, earning power, and present worth of public and private industrial properties. Prerequisites: senior standing in engineering; Fin. 125; Acctg. 104, previously or concurrently. Second semester.

C.E. 106 (30). Structural Design (3)

Design of structures in steel and wood. A required course principally for mining engineers. Prerequisite: *Mech. 111*. Second semester.

C.E. 140 (133). Transportation Engineering (3)

Study and design of transportation facilities, including highways, airways, railroads, and waterways, with emphasis on highway and airport design. Laboratory work includes studies of the suitability of various soils for subgrades. Prerequisites: C.E. 42; *Mech. 111*. Second semester.

Mr. Jensen

C.E. 150 (15). Structural Theory: Stresses (4)

Algebraic and graphic determination of stresses in roof and bridge trusses under dead, live, and wind loads. Prerequisite: *Mech. 111*.

C.E. 151 (118). Structural Theory (3)

Introductory course in the theory of structural steel design including riveted and welded connections, pins, tension members, columns, and beams. Prerequisites: *Mech. 111*; C.E. 150; *Mech. 112*.

Messrs. Eney, Kolm

C.E. 152 (119). Structural Design (3)

Advance course in the analysis and design of several complete structural steel structures including a rolled beam bridge, a plate girder bridge, a truss highway bridge, a mill building and a tall office building. Prerequisites: C.E. 151.

Messrs. Eney, Kolm

C.E. 153 (121). Reinforced Concrete Theory (3)

Introduction to the theory and design of simple reinforced concrete structures. Laboratory work includes the preparation of concrete mixtures and tests of control cylinders, beams, and columns. Prerequisites: C.E. 150; Mech. 112. Messrs. Loewer, Sutherland

C.E. 160 (128). Sanitary Engineering (3)

Fundamental principles of the design of water supply and sewage systems and of water and sewage treatment plants. Prerequisites: Mech. 121 or Ch.E. 171. First semester. Mr. Snyder

C.E. 161 (129). Sanitary Engineering Design (3)

Continuation of C.E. 160. Detailed design of water and sewage systems, including the complete design of water and sewage treatment plants. Inspection trips to nearby water and sewage treatment plants. Prerequisite: C.E. 160. Second semester. Mr. Snyder

For Advanced Undergraduates and Graduates

C.E. 301 (135). Structural Welding (1)

The design of welded steel structures together with a study of current literature. A few periods will be devoted to the manual operation of making welds. Prerequisite: senior standing in civil or mechanical engineering. Second semester. Mr. Jensen

C.E. 320 (141). Hydraulic Engineering Projects (3)

Hydrology, analysis of design of earth and gravity dams, outlet structures, flood control methods, and flood routing. Prerequisites: Mech. 121; Mech. 123. First semester. Mr. McPherson

C.E. 321 (142). Water Power and Hydraulic Machinery (3)

Water power hydrology, turbine selection, model turbine tests; study of penstocks, flumes, surge tanks, control gates, etc.; pump selection and pump tests. Prerequisites: Mech. 121, 123. Second semester. Mr. McPherson

C.E. 340 (136). Soil Mechanics (3)

An introduction to the study of the mechanics of soils, including soil classification, permeability, compressibility, shear strength, bearing capacities, stability of embankment. Prerequisite: Mech. 111. First semester. Mr. Jensen

C.E. 350 (124). Structural Theory (3)

An introduction to the study of stresses in indeterminate structures. Prerequisite: C.E. 115. First semester. Messrs. Eney, Loewer, Johnston

C.E. 351 (120). Structural Design: Timber (1)

Wood construction. Prerequisite: C.E. 151. Second semester.

Messrs. Eney Lieng

C.E. 353 (122). Reinforced Concrete Design (3)

Application of the principles of continuity to the design of concrete structures, including buildings and rigid frame bridges. Prerequisites: C.E. 152; C.E. 350. Second semester.

Messrs. Loewer, Suterland

C.E. 360 (131). Advanced Sanitary Engineering (3)

Engineering and public health; consideration of such matters as garbage and refuse collection and disposal, street cleaning methods, air conditioning, insect-borne diseases, rural sanitation, public health administration. Prerequisite: C.E. 160. Second semester.

Mr. Snyder

For Graduates

The following courses are open to engineering graduates only. The prerequisite for any course listed is a course of similar title on a less advanced level. Math. 417 and 419, Theory of Elasticity, Math. 429 and 430, Advanced Analytic Mechanics, and Mech. 402, Advanced Analytical Mechanics, may be included in a graduate major.

C.E. 400 (111). Research Methods (3)

Research procedures as applied to engineering materials and structures; methods of experimental stress analysis. First semester.

Mr. Loewer

C.E. 401 (114). Mechanical Methods of Stress Determination (3)

Use of mechanical devices in investigation of special problems, such as temperature deformations, foundation displacements, and integral action of structures; theory of similitude. First semester. (Offered 1951. Given in alternate years.)

Mr. Eney

C.E. 402 (125). Structural Model Analysis (1-3)

Individual structural research problems, with report. Prerequisite: C.E. 401. Second semester. (Offered 1951. Given in alternate years.) Mr. Eney

C.E. 403 (106). Plain and Reinforced Concrete (3)

Critical review of recent research; correlation of research with analysis and design. Given in alternate years. First semester. (Fall 1951.)

Mr. Loewer

C.E. 404 (213). Structural Research (2-5)

Individual research problems with reports. First or second semester.

Messrs. Eney, Jensen, Johnston, Loewer

C.E. 405 (219). Structural Welding (3)

Continuous and non-continuous construction with welded connections; distortion effects; current research. (Offered 1952. Given in alternate years.) First semester.

Mr. Jensen

C.E. 420 (232). Run-Off and Stream-Flow (3)

Occurrence and distribution of water by natural processes. Analysis of climatological and stream flow data. Frequency and intensity of storms and floods. Storage and open channel problems. First semester. (Fall 1951 and alternate years.)

Mr. McPherson

C.E. 421 (233). Hydraulic Laboratory Practice (2-5)

Study of theory and methods of hydraulic experimentation simultaneously with laboratory work. First or second semester.

Mr. McPherson

C.E. 422 (235). Hydraulic Research (2-5)

Individual research problems with reports. First or second semester.

Mr. McPherson

C.E. 440 (236). Soils Research (2-5)

Individual research problems relating to soil mechanics, with reports. Prerequisite: C.E. 340 or the equivalent. First or second semester.

Mr. Jensen

C.E. 441 (217). Foundation Engineering (3)

Design of foundations for airport runways; stabilization of soil by cement and tar; unwatering of foundations; bearing capacity of soils; settlement predictions. Prerequisite: *C.E. 340 or the equivalent*. Second semester. (Spring 1952. Given in alternate years.)

Mr. Jensen

C.E. 450 (201). Advanced Structural Theory (3)

The design and investigation of statically indeterminate structures of steel and reinforced concrete, including arches. First semester.

Messrs. Eney, Sutherland

C.E. 451 (202). Advanced Structural Theory (3)

Continuation of C.E. 450. Second semester.

Messrs. Eney, Sutherland

C.E. 452 (221). Structural Members and Frames (3)

Elastic and inelastic behavior of structures and their components. Problems in stress analysis, bending, torsion and stability. First semester.

(Offered in Fall 1952. Given in alternate years.) Mr. Johnston

C.E. 453 (222). Structural Members and Frames

Continuation of C.E. 452. Second semester. (Offered 1953.)

Mr. Johnston

C.E. 454 (216). Plate and Shell Structures (3)

Analysis and design. Applications to both reinforced concrete and steel construction. Given in alternate years. First semester. (Offered 1952)

C.E. 455 (211). Structural Dynamics (3)

Response of structures to impact and vibration; applications to engineering design. Second semester. (Offered 1952. Given in alternate years.)

Mr. Johnston

C.E. 456 (209). Structural Seminar (3)

Study of current discussion in the field of structural theory and design. First semester. (Given in alternate years.)

Messrs. Eney, Sutherland

C.E. 457 (210). Structural Seminar (3)

Continuation of C.E. 209. Second semester. (Given in alternate years.)

Messrs. Eney, Sutherland

C.E. 460 (207). Sanitary and Hydraulic Engineering (3)

Study of the design of reservoirs, tanks, and pipe lines for water supply systems, and of sewers and other appurtenances for sewage systems; inspection of existing plants, with reports thereon. First semester. (Not offered 1951-1952.)

Mr. Snyder

C.E. 461 (208). Sanitary and Hydraulic Engineering (3)

Continuation of C.E. 460. Second semester. (Not offered 1951-1952.)

Mr. Snyder

MECHANICS

Mech. 1. Statics (3)

Composition and resolution of forces; analytical and graphical analysis of force systems in equilibrium; friction; center of gravity; moment of inertia. Prerequisite: *Math. 12 and Phys. 22 previously or concurrently*. First semester.

Mech. 2. Dynamics (3)

Kinematics and kinetics of translation and rotation, of plane motion; moment of inertia; relative motion; work; power; energy; impulse and momentum. Prerequisites: *Mech. 1; Math. 12; Phys. 22*. Second semester

Mech. 3. Statics and Dynamics (3)

A condensation of Mech. 1 and Mech. 2. Prerequisite: *Math. 12; Phys. 22*. First and second semesters.

Mech. 111 (11). Mechanics of Materials (3)

Strength and elasticity of materials; theory of stresses and strains; deflection of beams and shafts; torsion; buckling of struts. Prerequisites: *Mech. 1 or Mech. 3; Math. 13 previously or concurrently*. First and second semesters.

Mech. 112 (12). Advanced Mechanics of Materials (3)

Further topics in column and beam theory, including unsymmetrical bending, combined stresses, conjugate beam methods, curved beams, impact loadings, buckling. Prerequisite: Mech. 111. Second semester.

Mech. 113 (13). Materials Testing Laboratory (1)

Experiments on wood, iron, and steel to determine the action of materials under stress and to study the physical properties of materials of construction. Prerequisite: *Mech. 111, preferably concurrently or previously*. First and second semesters.

Mech. 121 (21). Mechanics of Fluids (3)

The behavior of real fluids and the more important physical laws; potential flow, laminar flow, boundary layer, turbulence, and waves, with practical applications to flow through orifices, and to weirs and pipes, open channels, turbines and pumps. Prerequisites: *Mech. 2 or 3; Math. 13*. First and second semesters.

Mech. 123 (23). Hydraulics Laboratory (1)

Experiments in the flow of water and in the testing of hydraulic machinery. Prerequisite: *Mech. 121 preferably concurrently or previously, or Ch.E. 171 previously or concurrently*. First and second semesters.

For Advanced Undergraduates and Graduates

Mech. 225 (125). Aerodynamics (3)

Fundamentals of fluid mechanics applied to wing and propeller theory and to the drag of airplane parts; the Prandtl theory of lift and drag; principles of similitude, with application to wind tunnel tests. Prerequisites: *Mech. 121; Math. 206*. First semester.

Mr. Beer

Mech. 226 (126). Aerodynamics (3)

Dynamics of the airplane; performance calculations; climbing, gliding, and other types of flight; theory of stability and control. Prerequisite: *Mech. 225*. Second semester. Mr. Beer

Mech. 302 (101). Advanced Dynamics (3)

Elements of vector analysis, including sum and products of vectors, gradient, divergence, curl; application to equilibrium and motion of a point and a rigid body; fundamental dynamical theorems and their application to engineering problems, moving frames of reference, impulsive forces, gyroscopic motion; introduction to generalized coordinates, Lagrange's equations. Prerequisites: *Mech. 2 or 3; Math. 206, or 207, or 219, or consent of instructor*. Second semester. Messrs. Beer, Kleinschmidt

Mech. 321. Intermediate Fluid Mechanics (3)

Fundamental principles of fluid motion with emphasis on hydraulic applications. A continuation of Mechanics 121. Prerequisites: Math. 14, Mech. 121. First or second semester. Mr. McPherson

For Graduates

Mech. 402 (201). Advanced Analytical Mechanics (3)

Fundamental dynamical theorems and their application to advanced problems; gyroscopic motion; generalized coordinates, Lagrange's equations, fixed and moving constraints; non-holonomic systems, principle of least constraint; Hamilton's canonical equations, principle of least action; general methods of integration of the dynamical equations, integral invariants, Poisson brackets. Prerequisite: *Mech. 302; Math. 206; on consent of instructor*. Second semester. Mr. Beer

Mech. 421 (231). Hydrodynamics (3)

Mathematical theory of fluids; potential; two and three-dimensional flow problems. Prerequisite: *Math. 206; on consent of instructor*. First or second semester. Mr. Beer

A reference list of new and old numbers will be found at the back of the catalog.

CLASSICAL LANGUAGES

Professor Crum

Assistant Professor Maurer

GREEK

Gk. 1. Elementary Greek (3)

For all students who desire to obtain a knowledge of the fundamentals of the Greek Language. Early in the semester there will be reading in stories and legends in easy Greek. First semester.

Gk. 2. Elementary Greek (3)

Continued work in Greek vocabulary, forms, and syntax. Selections from Xenophon's *Anabasis*. Prerequisite: Gk. 1. Second semester.

Gk. 3. Second-Year Greek (3)

Anabasis; *Iliad* (if time permits); grammar and simple composition. Prerequisites: Gk. 1 and 2, or one year of entrance Greek. First semester.

Gk. 4. Second-Year Greek (3)

Continuation of Gk. 3. Second semester.

Gk. 7. Thucydides (3)

One or more books. Composition. Prerequisite: Gk. 4. First semester. (Not offered in 1951-52.)

Gk. 8. Tragedy (3)

Euripides: *Medea*, *Bacchae*, or another play; Sophocles: *Oedipus Tyrannus*, *Antigone*, or another. Literary study of the drama; poetical language, style, and conception; metrical reading; composition. Prerequisite: Gk. 4. Second semester. (Not offered in 1951-52.)

Gk. 9. Dramatic Poetry (3)

Aeschylus: *Agamemnon* or *Prometheus Bound*; Aristophanes: *Clouds*, *Frogs*, or *Birds*; Aristophanes as humorist and as moralist, with consideration of the tendencies which he satirized; metres; elementary text-criticism. Prerequisites: Gk. 4 and consent of head of department. First semester.

Gk. 10. Greek Oratory (3)

Selections from the earlier Attic orators and Demosthenes. Rapid reading, the student being supposed to have reasonable facility in understanding the Greek directly without rendering into English. Attention is directed largely to those points which illustrate the development of Greek prose style. Prerequisites: Gk. 4 and consent of head of department. Second semester.

Gk. 21. Ancient History (3)

The development of civilization from palaeolithic times to the world empire of Alexander the Great. The social, economic, religious, philosophic, artistic, and literary development of the ancient world; the origin of political institutions. First semester.

Gk. 99. Ancient Science (3)

A study of the architecture, mining, machinery, medicine, husbandry, etc., as developed by early peoples, especially by the Greeks and the Romans. A comprehensive view of the knowledge and use of natural resources. No knowledge of the Greek or Latin language is required. Second semester.

Gk. 111 (11). Homer (3)

Rapid reading of considerable portions of the *Iliad* or the *Odyssey*. Homeric language, syntax, and metre. Prerequisites: *Gk. 4 and consent of head of department*. First semester.

Gk. 116 (16). Plato (3)

Euthyphro, *Apology*, or other shorter dialogues. Grammar and composition. Prerequisites: *Gk. 4 and consent of head of department*. Second semester.

Gk. 183 (83). The Economic and Social Life of the Greeks (3)

A study of the activities of the Greeks with special reference to domestic arts, religion, athletics, warfare, medicine, education, social customs, and commerce; numismatics and vase painting. Lectures, collateral readings, and reports. No knowledge of the Greek language is required. First semester. (Not offered in 1951-52.)

For Advanced Undergraduates and Graduates

Gk. 200 (100). Greek Literature in English Translation (3)

The development of the major departments of Greek literature; required readings in English translations, with special attention to the epic, drama, and lyric poetry. No knowledge of the Greek language is required. First or second semester.

Gk. 202 (181). Greek Archaeology (3)

Aims and methods. A chronological presentation of prehistoric civilizations including the Neolithic, Minoan, Helladic, and Mycenaean periods. A study of extant ancient monuments, buildings, and city plans of important sites of the classical and Hellenistic periods. Lectures, collateral readings, and reports. No knowledge of the Greek language is required. Second semester. (Not offered in 1951-52.)

LATIN

Lat. 22. Ancient History (3)

Continuation of Gk. 21. The Hellenistic Age. Rome from its origin to 395 A.D. Second semester.

Lat. 61 (31). Beginning Latin (3)

For all students who desire to obtain a knowledge of the fundamentals of the Latin language. Special emphasis on English derivations and the principles of grammar. First semester.

Lat. 62 (32). Caesar (3)

The Gallic War, Books I-IV. Prose composition and syntax. Prerequisite: *Lat. 61*. Second semester.

Lat. 63 (33). Caesar (3)

Selections from the later books of the *Gallie War* or from the *Civil War*. Prose composition and syntax, with emphasis on clause construction. Prerequisite: Lat. 62 or 2 entrance units. First semester.

Lat. 64 (34). Cicero (3)

Continuation of Lat. 63. Cicero's orations and either *de Senectute* or *de Amicitia*. Prerequisite: Lat. 63. Second semester.

Lat. 65 (1b). Vergil (3)

Vergil: *Eclogues* and *Aeneid* I-VI; selections from Ovid. Practice in reading aloud and scansion; training in sight translation; the mythology and religion of Greece and Rome; the influence of Latin poetry upon English literature. Prerequisite: Lat. 64 or at least three entrance units. First semester.

Lat. 66 (2). Horace (3)

Selected Odes. Lectures on the history and development of lyric poetry; constant practice in reading the more important metres; memorization of stanzas and passages. Prerequisite: Lat. 65 or consent of head of department. Second semester.

Lat. 67 (4). Livy (3)

Selections from earlier books. Some study of early Roman history and topography. Selected poems of Catullus. Prerequisite: Lat. 66 or consent of head of department. First or second semester. (Not offered in 1951-1952.)

Lat. 68 (13). Latin Drama (3)

Drama among the Romans; native dramatic performances; indebtedness to Greek drama; the various dramatic forms and their vogue; chief writers; dramatic festivals; the Roman theater; influences on later literature. Reading of selected plays of Plautus, Terence, and Seneca. Prerequisites: Lat. 66 and consent of head of department. First or second semester. (Not offered in 1951-1952.)

Lat. 106. Roman Prose Writers of the Empire (3)

Selections from the following: Petronius, *Cena Trimalchionis*; Apuleius, Cupid and Psyche story from the *Metamorphoses*; Suetonius, *Lives*; Seneca, *Moral Epistles* and *Dialogues*; Tacitus, *Germania*. Prerequisite: Lat. 68 or consent of head of department. Second semester.

Lat. 108. Lucretius (3)

The finest literary passages and selected passages illustrating his philosophy. Ennius and some study of early Roman epic. Vergil's sixth *Aeneid*; an intensive study of its debt to Greek literature, religion, and

philosophy, and its influence on modern literature. Lectures on the history of the epic; collateral reading in the great epics of other literatures. Prerequisite: Lat. 68 or consent of head of department. First or second semester.

Lat. 169 (105). Satire (3)

Selected satires of Horace and Juvenal. Lectures on the history of Roman satire and its influence on modern literature; study of social conditions under the empire. Prerequisites: *Lat. 66 and consent of head of department.* First and second semesters. (Not offered in 1951-1952.)

Lat. 170. Mediaeval Latin (3)

Selected readings from the works of late Latin writers. Prerequisite: Lat. 66 and consent of head of department. Second semester.

Lat. 184 (84). The Economic and Social Life of the Romans (3)

A general survey of Roman life under the following heads: commerce, trade, industrial and domestic arts, agriculture, religion, athletics, amusements, warfare, medicine and surgery, education, marriage, funeral customs, costume, houses, and furniture. Lectures, collateral readings and reports. No knowledge of the Latin language is required. Second semester.

For Advanced Undergraduates and Graduates

Lat. 201 (125). Latin Literature in English Translation (3)

A study of Latin literature by means of the best English translations. The lives of the most important authors are studied and their works read according to the major departments of literature—history, comedy, epic, lyric, etc. Emphasis is placed on the chronological development of the literature and historical background necessary to the interpretation of the author's works. Lectures and readings with special reports. No knowledge of the Latin language is required. First or second semester.

Lat. 203 (182). Archaeology of Italy (3)

Neolithic, Terramare, Villanovan, and Etruscan cultures. Rome the City: its buildings, monuments, and streets, its destruction and rediscovery through excavation; origin and growth of the city; methods of identifying and dating monuments. A survey of Pompeii, Herculaneum, and Ostia. Lectures, readings, and reports. No knowledge of the Latin language is required. First or second semester. (Not offered in 1951-1952.)

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ECONOMICS AND SOCIOLOGY

Professor Diamond

Associate Professors F. B. Jensen and Jacobi

Assistant Professors R. M. Davis and Snider

Messrs. Bryski, Velez, Gelfand, Fraser, Parks, and Walters

ECONOMICS

Eco. 1. Industrial Evolution (3)

An introductory course outlining the gradual development of economic organization with special attention to the stages of economic progress and social institutions growing out of these stages. First semester.

Eco. 3. Economics (3)

A general course in the principles of economics, covering the fundamental forces governing the production, distribution, and consumption of wealth. The work deals with the basic institutions of economic life, the nature of production, the organization of productive enterprise, and the principles of value and price. Prerequisite: sophomore standing. First and second semesters.

Eco. 4. Economics (3)

A continuation of Eco. 3, in which the work deals with the principle of money and banking, the distribution of income, and important economic problems such as the business cycle, international trade, labor problems, social security, public finance, and alternative economic systems. Prerequisite: Eco. 3. First and second semesters.

Eco. 50. Economic Geography (3)

A survey of world resources and world trade, with special reference to the chief economic materials and the geographic and economic factors responsible for the position of the United States in the economic world. Second semester.

Eco. 111 (11). Marketing (3)

A detailed and critical analysis of the principles of marketing, designed to acquaint the student with major institutions and functions involved in the distribution of goods and services from the producer to the consumer. Prerequisites: Eco. 3; Eco. 4. First semester.

Eco. 113. Advertising (3)

The principles, practices, and problems of advertising with special reference to its social and economic aspects. Prerequisite: Eco. 111. First semester.

Eco. 115 (15). Retailing (3)

A study of modern retail institutions; principles and methods of retail organization and management; economic, social, and legislative aspects of the retailing structure. Prerequisite: *Eco. 111*. Second semester.

Eco. 160 (60). Insurance (3)

A non-mathematical course in the economic principles and business practice of insurance, particularly life, fire, and casualty insurance. Prerequisite: *Eco. 4*. Second semester.

For Advanced Undergraduates and Graduates

Eco. 206 (106). Intermediate Economic Theory (3)

Determination of prices in terms of the equilibrium of the business enterprise and consumer choices in markets of varying degrees of competition; determination of wages, rent, interest, and profits; interactions of consumption, savings, employment, and income. Prerequisite: *Eco. 4*. First or second semester.

Mr. Davis

Eco. 207 (107). Advanced Economics (3)

An advanced course in the principles of economics, dealing especially with the theory of the distribution of wealth, the nature of the productive process, the history of economic doctrines, and proposed plans for economic reform, such as socialism. Prerequisite: *Eco. 4*. First semester.

Mr. Davis

Eco. 208 (108). Advanced Economics (3)

Continuation of *Eco. 207*. Prerequisite: *Eco. 4*. Second semester.

Mr. Davis

Eco. 214 (114). Selling and Sales Management (3)

The principles and practices of modern selling and sales management; the function of distribution in modern management. Prerequisite: *Eco. 111* or consent of the instructor. Second semester.

Mr. Snider

Eco. 233 (133). Labor Problems (3)

The economics of labor; the history of labor movements in the United States, forms of labor organizations, and the methods and policies of trade unions. Prerequisite: *Eco. 4*. First semester.

Mr. Diamond

Eco. 234 (134). Labor Problems (3)

A continuation of *Eco. 233*. The relations of labor to the courts; social and labor legislation; unemployment, employee health, accidents, personnel work, etc. Prerequisites: *Eco. 4*; *Econ. 233*. Second semester.

Mr. Diamond

Eco. 235 (135). Transportation (3)

The economics of transportation by rail, highway, water, pipeline, and air; effects of transport costs on prices and on location of industries and markets; rate theory and practice; regulation, finance, government ownership, and coordination. Prerequisite: *Eco. 4*. First semester. Mr. Bryski

Eco. 236 (136). Public Utilities (3)

Rate-making, finance, combination, public ownership, federal power policy, and related problems in the electric, gas, and telephone industries. Prerequisite: *Eco. 4*. Second semester. Mr. Bryski

Eco. 271 (171). Readings in Economics (3)

Readings in various fields of economics, designed for the student who has a special interest in some field of economics not covered by the regularly rostered courses. Prerequisites: Preparation in economics acceptable to the head of the department. First semester.

Messrs. Davis, Diamond, Jensen, Snider

Eco. 272 (172). Readings in Economics (3)

Continuation of *Eco. 271*. Preparation in Economics acceptable to the head of the department. Second semester.

Messrs. Davis, Diamond, Jensen, Snider

SOCIOLOGY

Soc. 41. Cultural Anthropology (3)

The development of nonliterate cultures and social organizations. A comparative study of primitive institutions and social patterns, including: marriage and the family, religion, economic activities, political organization, folklore and language. The significance of nonliterate cultures for an understanding of contemporary society. First semester.

Soc. 42 (161). Principles of Sociology (3)

A course designed to introduce the student to the general field of sociology and familiarize him with the basic sociological concepts. Included are: group types, the mechanisms of group behavior, processes of social interaction, social structure, social institutions, social change, the individual and society. Second semester.

Soc. 44. The American Community (3)

Urban and rural communities in the United States, with emphasis on the urban community. Includes: Ecological patterns and growth, institutional organization, population characteristics and trends, social stratification, resources and problems, future development and planning. Prerequisite: *Soc. 41* or *Soc. 42*. Second semester.

For Advanced Undergraduates and Graduates

Soc. 262 (162). Social Problems (3)

Special problems of contemporary society, including population trends, crime, public health, poverty, child welfare, the handicapped, etc. Second semester. Mr. Diamond

Soc. 263. Community Organization for Social Services (3)

The philosophy and practices of modern social work. Includes: social work as an institution, the fields of social work, private and public welfare, the support and control of agencies, case work and group work, community organization, social legislation. Prerequisite: Soc. 41 or Soc. 42. First semester. (Not offered 1951-1952.) Mr. Jacobi

Soc. 264. The Family (3)

A sociological study of man's basic institution. Includes: an analysis of historical backgrounds, interaction within the family, relation to other groups and institutions, problems of family disorganization, legal aspects of marriage and divorce, family adjustment, the family in a changing society. Prerequisite: Soc. 41 or Soc. 42. First semester.

Mr. Diamond or Mr. Jacobi

Soc. 266. Population Problems (3)

Quantitative and qualitative aspects of U. S. and world population. Includes: causes and effects of migrations, racial composition and race relations, population theories, legal aspects, social consequences of population trends, present trends and future predictions. Second semester. (Not offered 1951-1952.) Mr. Diamond or Mr. Jacobi

Soc. 271 (171). Readings in Sociology (3)

Readings in various fields of sociology, designed for the student who has a special interest in some field of sociology not covered by the regularly rostered courses. Prerequisites: Preparation in sociology acceptable to the head of the department. First semester. Messrs. Diamond, Jacobi

Soc. 272 (172). Readings in Sociology (3)

Continuation of Soc. 271. Prerequisite: Preparation in sociology acceptable to the head of the department. Second semester.

Messrs. Diamond, Jacobi

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EDUCATION

Professors H. P. Thomas and Congdon

Associate Professor Bream

Assistant Professors Peterkin, Norris, Palevicz, Hahn,

F. G. Armstrong and Teal

Messrs. Hayward, L. R. Johnston, Watkins, Neidig, and Granger

Educ. O. Effective Study Methods

A practical course in study techniques and in the tools of study: including reading and fundamentals of mathematics, as the needs of individual students may require. An extensive testing program is carried on to assist the student in adjusting himself. Prerequisite: *consent of the instructor*. Second half of first semester.

Educ. A. Effective Study Methods (3)

A continuation of Educ. O. Prerequisite: *Educ. O.* Second semester.

Educ. 1. Introduction to Education (3)

A general introduction to the field of education, giving a broad survey of the work of the teacher and of the public schools: The aims, organization and materials of public education; the place of the Federal Government and the State in a program of public education; local problems, e.g., finance, law, buildings, personnel, school boards. Required for the Pennsylvania college provisional certificate. Should be taken during the junior year or earlier. First and second semesters.

Educ. 20. Educational Psychology (3)

An introductory course furnishing a psychological foundation immediately related to educational problems and practice. Practical problems involving analysis of designated material are assigned regularly for solution and report. Required for the college provisional certificate. Should be taken during the junior year. Should be taken with Educ. 153. Prerequisite: *Psych. 1*. First semester.

Educ. 152 (51). Principles of High School Teaching (3)

Basic methods of secondary instruction, including the objectives of education in relation to the curriculum; socialized procedure; problem-project method; contract plans; types of teaching related to different fields; directed study; organization of courses around criticized objectives; and the conduct of classes along the lines of individualized instruction. Recommended for the college provisional certificate. Should be taken with Educ. 154. Prerequisites: *Educ. 1, 20*. Second semester.

Educ. 153 (53). Observation of Secondary School Teaching (3)

Study, directed observation, and discussion of the various phases of

teaching activity in high schools in or near Bethlehem. The class meets two hours each week. In addition, detailed reports are required for sixty observation periods. Required for the college provisional certificate. Prerequisites: *Educ. 1*; *Educ. 20* concurrently. First semester.

Educ. 154 (54). Practice Teaching of Secondary School Subjects (3)

An intensive practical application of the principles of teaching to classroom conditions. The class meets two hours each week, in sections according to major interests, for the study of teaching procedure, actual organization, and planning of courses around definite objectives. A minimum of sixty periods of acceptable supervised practice in classroom instruction is required. Students must have at least one free hour at the same time each day throughout the week. Required for college provisional certificate. Prerequisites: *Educ. 153* and *fifteen semester hours in each subject the candidate expects to teach*. Second semester.

Educ. 156 (56). Practice Teaching of Secondary School Subjects (3)

A continuation of *Educ. 154* required of students who desire certification in New Jersey. Teaching must be done in a field for which practice teaching credit has not been granted previously. Prerequisites: *Educ. 153* and *fifteen semester hours in the subject the candidate expects to teach*. *Educ. 154* may be taken concurrently. Second semester.

For Advanced Undergraduates and Graduates

Educ. 321 (121). The Diagnosis and Adjustment of Reading Difficulties (3)

The psychology of reading as related to learning difficulties; the fundamental skills of reading, including eye movements, the measurement and diagnosis of reading difficulties, and recent experiments with remedial procedure; practice in the development of material for remedial instruction. Prerequisite: *consent of the instructor*. First or second semester.

Mr. Hahn

Educ. 330 (130). History of Education in Europe (3)

A survey of the Greek, Roman and early Christian periods; late medieval and early modern periods; European movements since the French Revolution and their implications for American education. Second semester.

Mr. Bream

Educ. 331 (131). History of Education in the United States (3)

The development of primary, secondary, and higher education in the United States; the aims, curricula, methods, and systems of education through five periods, from Colonial times to the present, in relation to the social conditions and processes. First semester.

Mr. Bream

Educ. 350 (150). Principles of Secondary Education (3)

An introductory course in the field of secondary education. The aims, organizations, and materials of secondary education; characteristics of

secondary school pupils; and a general treatment of the problems of secondary education. Recommended for the college provisional certificate. Prerequisite: *consent of the instructor*. Second semester. Mr. Peterkin

Educ. 351 (151). Organization of Materials of Instruction (3)

A practical course for the teacher in service, offering opportunity for cooperative planning of courses and units of instruction. Applying the principles of curriculum construction to the selecting, assembling, and organizing of materials of instruction. The teacher is advised to work in his field of special interest. Prerequisite: *consent of the instructor*. Second semester. Mr. Bream

Educ. 360 (160). Personnel Practices in Business and Industry (3)

A study of the techniques and principles used in the understanding and treatment of industrial problems confronting the line organization. Personnel administration as both a line and staff function. Case studies used for discussion of employee services, wage administration, and building, training and maintaining the labor force. Prerequisite: *consent of the instructor*. Mr. Gould

Educ. 371 (171). Elementary Educational Statistics (3)

Designed to give teachers and administrative officers the techniques necessary to enable them to gather data and present the results of their work in their classrooms and schools. Provides a practical knowledge of the simpler statistical methods for use in handling common problems and in understanding educational literature. Prerequisite: *consent of the instructor*. First semester. Messrs. Armstrong, Thomas

Educ. 373 (173). Diagnostic and Remedial Teaching (3)

The analysis and treatment of difficulties in the various subjects. The student may select any subject in which he has adequate background as his field of work. Practice is given in the development of materials, and actual work with failing pupils is expected. Prerequisite: *consent of the instructor*. Summer session. Mr. Norris

Educ. 390 (190). Visual Instruction (3)

Types of visual aids, the special value of each, their use in different subjects, the psychological basis for the use of such material, and the standards for the selection of visual sensory aids. Required for the permanent college certificate. May be completed as an undergraduate course or after graduation before application is made for the permanent college certificate. Second semester. Mr. Peterkin

Educ. 391-392 (191-192). Workshop (3, 5, or 6)

Cooperative study of current educational problems. Designed to provide elementary and secondary school teachers an opportunity to work at their

own teaching levels and in their own fields. Students will be limited to one workshop during a summer session but may eventually register for more than one, provided there is no duplication in subject matter. Summer session. Messrs. Bream, Hayward

For Graduates

The major in education on the graduate level is intended for students preparing for school administration and supervision and for other types of public school positions as well as for specialists in elementary and secondary education. Preparation is offered for such positions as superintendent of schools, supervising principal, elementary principal, secondary principal, and guidance counselor. All work is approved by the state councils of education of Pennsylvania and New Jersey.

At least four semester courses in education are prerequisite for a graduate major in this field. The prerequisites may be taken concurrently with a partial major program. Attention is called to Educ. 321, 330, 331, 350, 351, 360, 371, 373, and 390, all of which are open to advanced undergraduates and graduate students, and which may be taken as part of a major or as collateral work in education.

Educ. 419 (219). Social Policy and Education (3)

A critique of the aims of education in the modern social order; the nature, needs, and adjustments of modern industrial society; the conflicting demands upon education by a changing civilization as represented by modern social points of view; the implications, for education, of contemporary American philosophy of democratic social progress. Prerequisite: *consent of the instructor*. First semester. Mr. Bream

Educ. 420 (220). Advanced Educational Psychology (3)

Study and practice of techniques and methods involved in making a detailed psychological analysis of the pupil, particularly in relation to school problems. Prerequisite: *consent of the instructor*. Second semester. Mr. Norris

Educ. 422 (222). Education of Exceptional Children (3)

Methods of instruction and provision of materials for children who differ markedly from the normal, i.e., gifted, subnormal, and maladjusted; the problems of the teacher in a system that makes little provision for the exceptional child. Actual case studies of pupils are required. Prerequisite: *consent of the instructor*. Second semester. Mr. Norris

Educ. 423 (223). Psychology of School Subjects (3)

An analysis of the psychological development and behavior of pupils in connection with school subjects at all levels. Diagnostic work. Each student has an opportunity to emphasize the subject of his special interest. Summer session. Mr. Norris

Educ. 440 (140). Principles of Elementary Education (3)

The aims, organization, and materials of elementary education; characteristics of elementary school pupils; and a general treatment of the problems of elementary education. Mr. Bream

Educ. 443 (243). Elementary School Administration (3)

The major problems of organization and administration of elementary schools; types of organization, pupil promotion, time allotment, service agencies, and plant and equipment. Required for a principal's certificate. First semester. Mr. Hayward

Educ. 444 (244). The Elementary School Curriculum (3)

Problems of curriculum development in the first six grades; subject matter placement, program-making for different types of schools, regular vs. special subjects, articulation, and similar problems. Second semester. Messrs. Bream, Hayward

Educ. 446 (246). Elementary School Supervision (3)

Methods, materials, organization, and evaluation of supervision. Each student will be required to develop a supervisory program for a subject or a school. Second semester. Mr. Hayward

Educ. 447 A-F (247 A-F). Current Problems in Elementary School Subjects (3)

A. Reading and Language. B. Arithmetic. C. Social Studies. D. Science. E. Language Arts. F. Arts and Crafts. Selection, study and development of problems with reference to the various levels of the elementary school. Special attention will be given to students' classroom problems. Classes will be limited to a consideration of one subject. First and second semesters. Messrs. Bream, Hayward

Educ. 453 (253). Secondary School Administration (3)

The major problems of organization and administration of secondary schools: program of studies, teaching staff, pupil personnel, plant and equipment, and community relationships. Required for a principal's certificate. Prerequisite: *Educ. 350 or its equivalent*. Second semester. Mr. Johnston

Educ. 454 (254). The Secondary School Curriculum (3)

Related to Educ. 453, but organized in such a way that it may be taken independently. Methods of study of curriculum problems, the selection of subject matter in various fields, the principles of program construction, and similar problems. Prerequisite: *Educ. 350 or its equivalent*. Second semester. Messrs. Johnston, Norris, Peterkin

Educ. 456 (256). Supervision in Secondary Schools (3)

Related to Educ. 453 and 454, but may be taken independently. The purpose of supervision, a program for the improvement of teaching, the evaluation of teaching, measurement, supervisory relationships, and similar problems involved in the supervision of instruction in secondary schools. Prerequisite: *Educ. 350 or its equivalent*. First semester. Mr. Johnston

Educ. 457 (257). Modern Trends in Teaching (3)

Designed for the teacher in service and for principals who wish a knowledge of the most recent developments in the trends and techniques of teaching. Special attention is given to experimental studies in the field of method. Students will be sectioned on the basis of interest in elementary or secondary education. Prerequisite: *consent of the instructor*. First semester. Messrs. Hayward, Peterkin

Educ. 458 (258). Extra-Curricular Activities (3)

A cooperative study in the philosophy and psychology supporting activity programs; their organization and administration. Emphasis will be given to the teacher's part in the program, e.g., clubs, student councils, homeroom and class organization, assemblies, publications, finance. First semester. Messrs. Granger, Johnston

Educ. 463 (263). Public School Administration (3)

A systematic treatment of the problems of administration, local, state, and national. The newer developments which are modifying educational administration: state authorization and organization, the board of education, the superintendent of schools, personnel management, business administration, financial support, and public relations. First semester. Messrs. Thomas, Neidig, Watkins

Educ. 464 (264). Foundations of Curriculum Construction (3)

Principles of curriculum construction which underlie the reorganization of the program of studies for elementary and secondary schools. Consideration of the origin and background of the curriculum, methods of organization, state, county, and city programs, curriculum planning and development, techniques for developing materials, and similar pertinent topics. First semester. Messrs. Johnston, Norris, Peterkin

Educ. 466 (266). Supervision of Instruction (3)

Analysis of the principles underlying the organization and supervision of instruction. Applications to specific teaching situations. No lines will be drawn between the elementary and the secondary school. Mr. Thomas

Educ. 468 (268). Vocational Education (3)

The social basis for vocational education; present practices and trends in the major types of vocational education; recommendations for organization and administration teaching problems; student employment; laws and regulations. Messrs. Neidig, Teal

Educ. 472 (272). Educational Tests and Measurements (3)

Selection of educational tests, organization of a testing program, use of tests in classification, construction of classroom tests, use of tests in improving teaching, and diagnosis of pupil difficulties. Students will be sectioned on the basis of interest in elementary or secondary education. For advanced work in this field attention is called to the seminar and individual research courses. Second semester.

Mr. Armstrong

Educ. 482 A-B (282 a-b). Educational and Vocational Guidance (3)

a. General Introduction (2).

General principles of guidance. Discovery of interests and abilities, study of occupations, study of educational opportunities, guidance activities, group programs, student personnel problems.

b. Organization of School Programs (1).

Analysis and development of homeroom programs, school programs, and community programs.

Mr. Palevicz

Educ. 483 (283). Techniques of Counseling (3)

An intensive examination of personnel techniques including interviews, rating scales, and counseling by such means as lectures, demonstrations, and case histories. Case studies of selected students are required. Required for guidance counselor's certificate.

Messrs. Armstrong, Hahn

Educ. 484 (284). Occupations (3)

Trends in supply and demand of workers in various occupations; requirements for occupations; sources of descriptive materials; testing for occupational aptitude. Required for guidance counselor's certificate.

Messrs. Palevicz, Teal

Educ. 491-492 (291-292). Seminars (3)

One seminar is organized in each half-year provided three or more students select such work. These courses do not duplicate the courses of individual research. It is the purpose of seminar courses to provide for co-operative study of special problems in the field of elementary and secondary education. Prerequisite: *consent of the instructor*. First and second semesters. Messrs. Bream, Granger, Hayward, Johnston, Norris, Peterkin

Educ. 493-494 (293-294). Individual Instruction, Field Work, or Research (3)

Open to students with appropriate preparation and needs for pursuing independent investigation. The student must have shown interest in and capacity for advanced work in the chosen field, evidenced in part by an approved plan of work. Prerequisite: *consent of the instructor*. First and second semesters.

Messrs. Bream, Congdon, Hayward, Johnston, Norris, Peterkin, Thomas, Watkins

Educ. 495-496 (295-296). Seminar in School Administration (3)

Cooperative study of special problems in the field of school administration. Appropriate problems include: finance, building programs, business management, and school law. Prerequisite: *consent of the instructor*. First and second semesters.

Messrs. Bream, Norris, Peterkin, Thomas, Watkins, Neidig

A reference list of new and old numbers will be found at the back of the catalog.

ELECTRICAL ENGINEERING

Professors Bewley, Beaver, and A. R. Miller

Associate Professors Mode and Gruber

Assistant Professors Karakash and Donaldson

Messrs. Close, Bressler, and MacFarland

E.E. 2 (32a). Direct Current Machinery (3)

Direct current circuits; magnetic circuits; direct current machine construction, operation, and control; generated voltages, forces on conductors, armature winding, machine characteristics. Prerequisites: *Phys. 24; Math. 13; Math. 14 concurrently*. Second semester.

E.E. 3 (33a). Direct Current Laboratory (1)

A coordinated laboratory course supplementing the classroom work in E.E. 2. Experimental studies and tests of direct-current machines and appliances, including characteristics, regulation, efficiency, etc. Prerequisite: *E.E. 2 concurrently*. Second semester.

E.E. 100 (24). Summer Work

During the vacation following the junior year each student in electrical engineering is required to spend at least eight weeks getting practical experience in some approved shop or plant. A written report on the shop or plant, and the experience gained therein, is due on or before January 8. These reports should contain such calculations, photographs, drawings, and plots as each individual case may require.

E.E. 104 (34). Alternating Current Circuits (3)

Alternating current conceptions; laws for series and parallel circuits containing R, L, and C; vector methods; complex quantities; single and polyphase circuits and networks; power; Fourier series; harmonics; superposition. Prerequisites: *Math. 14; Phys. 24; E.E. 2, or E.E. 160 and 161; Math. 207 previously or concurrently*. First semester.

E.E. 105 (35). Alternating Current Circuits Laboratory (1)

Supplements E.E. 104. Alternating current circuit experiments, with oscillographic studies. Prerequisite: *E.E. 104 concurrently*. First semester.

E.E. 106 (36). Alternating Current Machines (3)

The electrical, magnetic, and mechanical features of single and poly-phase transformers and induction motors. Prerequisites: *E.E. 104*, *EE. 107 concurrently*. Second semester.

E.E. 107 (37a). Alternating Current Machine Laboratory (1)

Supplements E.E. 106. Laboratory tests on transformers, transformer banks, and induction motors. Prerequisite: *E.E. 106 concurrently*. Second semester.

E.E. 108 (38). Alternating Current Machines (3)

A continuation of E.E. 106. The electrical, magnetic, and mechanical features of synchronous generators, motors, and converters; parallel operation. Prerequisites: *E.E. 106*; *E.E. 109 concurrently*. First semester.

E.E. 109 (39). Alternating Current Machine Laboratory (2)

A continuation of E.E. 107, supplementing E.E. 108. Laboratory tests on synchronous generators, motors, and converters; measurement of constants, parallel operation, calculations. Prerequisite: *E.E. 108 concurrently*. First semester.

E.E. 110 (40). Industrial Electronics (3)

A study of the fundamentals of electronic discharges in vacua and gases; operating characteristics of vacuum and gaseous tubes, mercury arc rectifiers, photoelectric cells, cathode ray oscillographs, industrial electronic control devices, etc. Prerequisite: *E.E. 104 or Phys. 212*. Second semester.

E.E. 111 (117). Electrical Engineering Proseminar (1)

A weekly meeting for discussion of topics from the current journals of theoretical and applied electricity. Presentation of papers on assigned topics. Prerequisite: senior standing. Second semester.

E.E. 120 (103). Industrial Applications (4)

Selected topics on motor applications, control devices, industrial electronics, electric traction, conversion apparatus, illumination, electric heating, electrolytic processes, and the economics of power. The emphasis placed on any one of these subjects will depend on the interests of the class. Separate sections may be formed to accommodate a variety of such interests.

E.E. 133. Transmission Lines (3)

Long distance transmission of power; determination of line constants; geometric mean distances; corona; interference; differential equations and solutions; general circuit constants; regulation; losses and efficiency; mechanical design of lines; economics of power transmission. Prerequisites: *Math. 207, E.E. 108 concurrently*. First semester.

E.E. 141. Radio Communication (4)

The principles of radio communication; high frequency alternating currents, resonant circuits, and amplifier circuits; laboratory measurements on audio and radio circuits. Prerequisite: *E.E. 110*. First semester.

E.E. 142. Radio Communication (3)

Continuation of E.E. 141. A study of detection, oscillation, amplitude, and frequency modulation, and television. Prerequisite: *E.E. 141*. Second semester.

E.E. 143. Wire Communication (3)

Introductory theory of networks; bridge and coupled circuits; impedance matching; telephone circuits; transmission lines at audio and carrier frequencies; communication apparatus. Prerequisite: *E.E. 110*. First semester.

E.E. 144. Wire Communication (3)

Continuation of E.E. 143. Wave filters, repeaters, corrective and balancing networks; electro-acoustics; laboratory measurements on wire communication circuits. Prerequisite: *E.E. 143*. Second semester.

E.E. 160 (60). Electrical Circuits and Apparatus (3)

Theory and applications of direct-current and alternating-current circuits, electronics, and direct-current and alternating-current machines and apparatus. Prerequisites: *Math. 13, Phys. 24*. First or second semester.

E.E. 161 (61). Electrical Problems (1)

A three-hour problem period to accompany E.E. 160. Prerequisite: *E.E. 160 concurrently*. First or second semester.

E.E. 162 (62). Dynamo Laboratory (1)

Tests on direct-and alternating-current circuits, apparatus and electronic devices. Prerequisite: *E.E. 160 concurrently*. First or second semester.

For Advanced Undergraduates and Graduates**E.E. 331 (131). Electric and Magnetic Fields (3)**

The calculation and construction of electric and magnetic fields for conductors, plates, vacuum tubes, slots, teeth, etc.; analogous problems

in fluid flow. The methods of the theory of functions of a complex variable and of Fourier series and integrals are introduced in sufficient detail to serve in the analytical work; the rules for freehand plotting are derived and applied. Prerequisites: *Math.* 207; *E.E.* 108 concurrently. First semester. Mr. Bewley

E.E. 332 (132). Electric Transients (3)

Electrical, mechanical, and heat flow transients of circuits, transmission lines, electrical machinery, and power systems; operational calculus, to include Fourier integral, Bromwich integral, Laplacian transform, and the direct operational method. Prerequisites: *Math.* 207; *E.E.* 331. Second semester. Messrs. Bewley, Mode

E.E. 334 (134). Transmission Line Transients (3)

Traveling waves; free and forced oscillations; reflections; transition points; multi-conductor systems; multi-velocity waves; attenuation and distortion; lightning surges; switching surges; arcing grounds; protective devices; surges in transformer and machine windings. Prerequisites: *E.E.* 133; *E.E.* 332 concurrently. Second semester. Mr. Bewley

E.E. 335 (135). Symmetrical Components (3)

The solution of unbalanced polyphase circuits by means of symmetrical components; system faults, open-circuit and short-circuit current and voltage calculations; sequence impedances of transmission lines, transformer banks, etc.; metering. Prerequisites: *E.E.* 108 and 109 concurrently. First semester. Messrs. Donaldson, Miller

E.E. 336 (136). System Stability (3)

Steady state and transient power limits of transmission systems; electro-mechanical characteristics of electrical machines and networks. Prerequisites: *E.E.* 335; *E.E.* 337 and 338 concurrently. Second semester. Mr. Miller

E.E. 337 (137). Advanced Machine Theory (3)

The transient theory of A. C. machines; balanced and unbalanced conditions; time constants; approximate and rigorous solutions. Prerequisites: *E.E.* 335; *E.E.* 332 and 338 concurrently. Second semester. Mr. Miller

E.E. 338 (138). Transients Laboratory (1)

An oscillographic laboratory study of transmission line transients, system stability, and machine transients. Prerequisites: *E.E.* 334, 336 and 337 concurrently. Second semester. Mr. Miller

E.E. 345 (147). Electromagnetic Theory (3)

Vector analysis; divergence, gradient, curl; Stokes' and Gauss' theorems; generalized coordinates; Maxwell's equations; Poynting's theorem; transmission reflection and refraction of waves; retarded potentials; parallel,

rectangular, and cylindrical wave guides; radiation from antennae; simple directive arrays; ground reflection. Prerequisites: Math. 207, E.E. 134. First semester. Messrs. Mode, Karakash

For Graduates

Graduate students intending to major in electrical engineering must have completed a program of study equivalent to that required for the B.S. in E.E. at Lehigh University.

Graduate courses are given to qualified men from the industries of the surrounding district.

E.E. 433 (223). Tensor Analysis of Electric Circuits and Machines (3)

The application of dyadics, matrices, and tensors to the theory of electric circuits and machinery; static networks, networks theorems, vacuum tube circuits, transformers, and transmission lines. First semester.

Mr. Bewley

E.E. 434 (224). Tensor Analysis of Electric Circuits and Machines (3)

Continuation of E.E. 433. The generalized machine; equations of motion, voltage, torque, small oscillations and power for holonomic, non-holonomic and quasi-holonomic reference systems; applications to all machines constituting special cases of the generalized machine; the equations of Lagrange, Maxwell, and Maxwell-Lorentz are used as starting points in the general theory. Second semester.

Mr. Bewley

E.E. 435 (213). Power System Stability (3)

Power flow in electric circuits; steady state power limits of systems having synchronous and asynchronous machines with salient poles or round rotors; stability criteria; and other related topics. First semester. Given in alternate years.

Mr. Miller

E.E. 436 (214). Power System Stability (3)

Continuation of E.E. 435. Transient stability problems, including machine inertias, governor action, unbalanced system conditions, various excitation systems and exciter transient effects, and switching operation. Second semester.

Mr. Miller

E.E. 437 (211). Advanced A.C. Machine Theory (3)

The two-reaction theory of synchronous machines in the steady and transient states; harmonic analysis; field and armature time constants; direct and quadrature synchronous, transient, and sub-transient reactances; electrical and mechanical transients of electrical machines, both singly and in conjunction with external circuits; calculation of voltage, current, mechanical oscillations, and hunting, forces and torques; operation of

machines under unbalanced conditions and faults; effect of variable excitation. Two lectures and one laboratory period per week. First semester. Given in alternate years. Mr. Miller

E.E. 438 (212). Advanced A.C. Machine Theory (3)

Continuation of E.E. 437. Second semester.

Mr. Miller

E.E. 441 (209). Advanced Electronic Circuits (3)

Selected topics covering wide band amplifiers, pulse amplifiers, and other special amplifier circuits. Transient analysis of amplifiers. Television systems. Radar techniques. Servomechanisms. Microwave circuits. First semester. Mr. Mode

E.E. 442 (210). Advanced Electronic Circuits (3)

Continuation of E.E. 441. Second semester.

Mr. Mode

E.E. 443 (219). Theory of Networks (3)

Consideration of electrical networks from the general standpoint. Characteristics of two- and four-terminal networks; Foster's, Cauer's, and Bartlett's theorems; transformation by matrix manipulation; theory of long-lines. First semester. Mr. Karakash

E.E. 444 (220). Advanced Network Theory (3)

Continuation of E.E. 443. Advanced network theory. General approach to filter theory for lumped as well as distributed parameter systems. General field equations and application to wave guides and cavities. Second semester. Mr. Karakash

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ENGLISH

Professors R. M. Smith and Severs

Associate Professors Riley, Strauch, Christensen, S. B. Ewing

Assistant Professors Rights, Armstrong, Everitt, Criswell, and Dilworth

Messrs. Hertz, Graber, W. B. White, Hartung, Nead, Wolf, Noonan, Kern, Neville, Byington, Domm, and Thompson

FRESHMAN COMPOSITION

All students are required to complete successfully courses in

freshman composition carrying a total of six credit hours toward graduation.

On the basis of their performance in preliminary tests given during freshman week, first semester freshmen are assigned to one of three courses designed to meet their particular needs. Engl. 1 is taken by all whose preparation appears to have been adequate but who do not give evidence of outstanding ability. Superior students take Engl. 11. Those who do poorly in the preliminary tests are required to take Engl. 0. Engl. 1 normally is followed by Engl. 2, and Engl. 11 by Engl. 12 in the second semester, while students who take and pass Engl. 0 in the first semester enroll in Engl. 1 in the second. A student whose classwork shows that he has been placed in the wrong group may be transferred to a higher or lower group at any time during the year, if his instructor recommends and the head of the department approves the transfer.

Since Engl. 0 carries no credit toward graduation, students assigned to this course in their first semester are required to continue the study of freshman composition beyond the freshman year until the minimum requirement of six semester hours has been met.

ENGLISH LITERATURE AND COMPOSITION

Students wishing to major in English literature should take as preliminary work either Engl. 4, 5, or 8, 9, or 11, 12, or such equivalent courses as may be recommended by the head of the department. They should then elect two English courses in each semester of the junior year and at least two in each semester of the senior year. Students working for honors take a seminar course in which they prepare a thesis as part of the honors requirement.

Engl. 0. Elementary Composition (0)

Drill in the fundamentals of English grammar and in the mechanics of writing. First and second semesters.

Engl. 1. Composition and Literature (3)

A rapid review of functional grammar and of sentence and paragraph structure; practice in outlining and original composition; readings in expository prose. First and second semesters.

Engl. 2. Composition and Literature (3)

Continuation of Engl. 1. Practice in expository writing, including documented papers and reports; readings in types of literature. First and second semesters.

Engl. 4. A Study of the Drama (3)

Reading and critical study of types of drama; theories of the drama; the drama and the stage; the drama as a criticism of life. Prerequisites: Engl. 1, 2. First semester.

Engl. 5. A Study of the Drama (3)

Continuation of Engl. 4. Prerequisites: Engl. 1, 2. Second semester.

Engl. 7. A Study of the Short Story (3)

A critical study of the short story, English, American, and Continental. Class discussions, extensive collateral reading, and reports. Prerequisites: Engl. 1, 2. Second semester.

Engl. 8. English Literature (3)

A survey of English literature from *Beowulf* through the Pre-Romantics, with selected readings. Prerequisites: Engl. 1, 2. First semester.

Engl. 9. English Literature (3)

A survey of English literature from Wordsworth to Housman. Prerequisites: Engl. 1, 2. Second semester.

Engl. 11 (3a). Types of World Literature (3)

A course in composition and literature for superior students who do not need the basic training of English 1 and 2. In addition to wide and thoughtful reading in world masterpieces the course requires correct and effective writing of critical essays, original sketches, and documented research papers. First semester.

Engl. 12 (3b). Types of World Literature (3)

Continuation of Engl. 11. Second semester.

Engl. 18. The Novel (3)

A study of the types of the novel. Reading and reports; lectures on the history of the novel in England and America. Prerequisites: Engl. 1, 2. First semester.

Engl. 19. The Novel (3)

Continuation of Engl. 18. Prerequisites: Engl. 1, 2. Second semester.

Engl. 20. American Literature, 1607-1855 (3)

A survey of the major writers from the settlement of America to the Civil War. Lectures and class discussions. Prerequisites: Engl. 1, 2. First semester.

Engl. 21. Modern American Literature (3)

A study of the development of American literature from Whitman to the present day. Lectures and class discussions. Prerequisites: Engl. 1, 2. Second semester.

Engl. 35. Types of Poetry (3)

A course in the reading of poetry, proceeding from simple verses to difficult, to provide a thorough acquaintance with the idioms of poetry so that it may be read not as a translation of a foreign language but as an intelligible and highly expressive use of our own. Prerequisites: Engl. 1, 2. Second semester.

Engl. 36. Masterpieces of World Literature (3)

A study of great works selected from the literature of epic poetry, the drama, the romance, philosophy, and the essay to illustrate the humanistic traditions of Western civilization. Not open to students who have taken Engl. 11 or 12. Prerequisites: Engl. 1, 2. First semester.

Engl. 41. Business Letters (3)

Rhetorical and psychological principles and forms in modern business communication; practice in writing letters of inquiry, request, reply, acknowledgment, adjustment, credit, collection, sales, and application. Prerequisites: Engl. 1, 2. First and second semesters.

Engl. 42. Technical Writing (3)

Study and practice in forms and methods of technical exposition, description, definition, classification; the technical report, abstract. Prerequisites: Engl. 1, 2. First or second semester.

Engl. 117. The Modern Play and Playwright (3)

Readings and discussion of the foremost American dramas and dramatists of stage, screen, and air. Some of the important playwrights represented are Maxwell Anderson, Robert Sherwood, Lillian Hellman, Norman Corwin, and Arch Oboler. Summer session. Mr. Christensen

Engl. 181 (81). Undergraduate Thesis (3)

Open to advanced undergraduates who wish to submit theses in English. First semester.

Engl. 182 (82). Undergraduate Thesis (3)

Continuation of Engl. 181. Second semester.

Engl. 183 (83). Readings in English Literature (3)

Open to advanced students who wish to pursue special courses of reading in English literature. First semester.

Engl. 184 (84). Readings in English Literature (3)

Continuation of Engl. 183. Second semester.

For Advanced Undergraduates and Graduates

Engl. 318 (118). American Literature (3)

Movements that have shaped American thought and feeling as expressed in the national literature: Puritanism, Americanism, Romanticism, Transcendentalism, Individualism, the Civil War, Democracy, the West, Realism, Internationalism, and Skepticism, as presented by Jonathan Edwards, Franklin, Paine, Longfellow, Poe, Emerson, Thoreau, Mark Twain, Henry James, and Henry Adams. Summer session.

Mr. Strauch

Engl. 320 (120). The Novel (3)

The great masterpieces of prose fiction produced in England, in America, and on the Continent during the nineteenth and twentieth centuries. Development of types of the novel. The theory and technique of the novel. Summer session.

Mr. Riley

Engl. 321 (121). Contemporary Literature (3)

Present-day American literature. Collateral readings and reports. Prerequisites: six hours chosen from Engl. 4, 5, 7; 8, 9; 11, 12; 18, 19; 20, 21, or from any of the courses in the 200, 300, or 400 groups. First semester.

Mr. Strauch

Engl. 322 (122). Contemporary Literature (3)

Present-day English and European literature. Collateral readings and reports. Prerequisites: same as for Engl. 321. Second semester.

Mr. Strauch

Engl. 323 (123). Shakespeare and the Elizabethan Drama (3)

The development of the English drama, including the important plays of Shakespeare. First semester.

Mr. Smith

Engl. 324 (124). Shakespeare and the Elizabethan Drama (3)

Continuation of Engl. 323. Second semester.

Mr. Smith

Engl. 325 (125). English Literature of the Romantic Era (3)

Poetry and prose of the chief romantic writers—Wordsworth, Coleridge, Scott, Byron, Shelley, Keats, Landor, Lamb, Hazlitt—with consideration of the political, religious, and social problems of the period as they are exhibited in the literature. Readings and class discussions. First semester.

Mr. Severs

Engl. 326 (126). English Literature of the Victorian Era (3)

Poetry and prose of the chief Victorian writers—Tennyson, Browning, Arnold, Clough, Rossetti, Morris, Swinburne, Macaulay, Carlyle, Mill, Newman, Ruskin—with consideration of the political, religious, and social problems of the period as they are exhibited in the literature. Readings and class discussions. Second semester.

Mr. Severs

Engl. 331 (131). Milton (3)

The life and works of John Milton in connection with the history of his times and the chief sources of his inspiration. First or second semester.

Mr. Riley

Engl. 333 (133). Restoration and Augustan Literature (3)

Prose and poetry from 1660 to 1745 with special emphasis upon the works of Dryden, Pope, and Swift, and some consideration of the influential ideas of Hobbes, Locke, Berkeley, and Hume. First semester.

Mr. Dilworth

Engl. 334 (134). Age of Johnson (3)

English prose and poetry from 1745 to 1798; Dr. Johnson and his circle, and the Pre-Romantics, including Burns and Blake. Second semester.

Mr. Dilworth

Engl. 335 (135). History of the English Language (3)

A survey of the development of the English language, in vocabulary, pronunciation, and structure, beginning with its relation to the other Germanic languages and coming down to modern English usage. First or second semester.

Mr. Ewing

Engl. 336 (136). Writing for Publication (3)

Comprehensive study of the short-story and practice in the various techniques of writing short-stories, essays, and poems with a view to publication. Prerequisites: junior standing or consent of the head of the department. First or second semester.

Mr. Criswell

Engl. 337 (137). The Renaissance (3)

The growth of English non-dramatic literature in the sixteenth century and the stimulus in the Italian Renaissance and northern humanism. Readings in and class discussions of the works of the chief writers—Petrarch, Erasmus, More, Wyatt, Surrey, Lyly, Sidney, and Spenser. First semester.

Mr. Ewing

Engl. 338 (138). The Seventeenth Century (3)

Continuation of Engl. 337. The rich variety of English literature from Donne to Dryden—Donne and the "Metaphysical School"; Jonson and "The Tribe of Ben"; Cavalier and religious poetry; the prose of Bacon, Brown, Burton, Walton, and Bunyan. Second semester. Mr. Christensen

For Graduates

Candidates for the master's degree majoring in English literature may qualify for the degree under either of two plans offered by the department. Under Plan I the candidate is required to complete successfully eight semester courses (twenty-four hours), and to write a thesis representing the equivalent of six hours of course work, but he is not required to take an examination covering the entire field. Under Plan II no thesis is required; but the student, in addition to completing successfully ten semester courses (thirty semester hours), must pass an examination, usually oral, covering the entire field of English literature. The candidate selects the plan better suited to his needs and abilities, upon the advice and with the approval of the head of the department.

If his needs and interests make it desirable for him to do so, the candidate for the master's degree is permitted to take collateral work in other departments to the extent of six semester hours in lieu of an equivalent amount in the major field.

Candidates for the doctor's degree are expected to master the subject matter of the entire field of English and American literature. Other requirements for the doctorate will be found on pages 125 to 129.

Students desiring to qualify for graduate degrees in this department should have taken as part of their undergraduate work at least twelve semester hours of advanced courses in English literature. Those with undergraduate deficiencies who are admitted because otherwise well qualified will be expected to make up such deficiencies in addition to satisfying the minimum requirements for the degree sought.

Engl. 420 (220). Graduate Seminar (3)

An intensive study of the works of an English author or a type of literature. Summer session. Messrs. Riley, Severs, Smith

Engl. 421 (221). Graduate Seminar (3)

Research and reports. First semester.

Mr. Smith

Engl. 422 (222). Graduate Seminar (3)

Continuation of Engl. 421. Second semester.

Mr. Smith

Engl. 427 (227). Old English (3)

A study of the Old English language and literature. First or second semester.

Mr. Riley

Engl. 429 (229). Literary Criticism (3)

A course aimed to correlate and unify the student's previous work in literature by means of wide reading in critical literature and discussions of theories and schools of criticism. First semester.

Mr. Smith

Engl. 430 (230). Literary Criticism (3)

Continuation of Engl. 429. Second semester.

Mr. Smith

Engl. 431 (231). Graduate Thesis (3)

First semester.

Mr. Smith

Engl. 432 (232). Graduate Thesis (3)

Second semester.

Mr. Smith.

Engl. 433 (233). Literature of the Fourteenth Century (3)

Types of medieval literature with special attention to Langland, Gower, Chaucer. (Not offered 1951-1952.)

Mr. Severs

Engl. 434 (234). Chaucer (3)

A study of the life and works of Chaucer, with some attention to his chief contemporaries. Readings, reports, and class discussions. First semester.

Mr. Severs

Engl. 435 (235). Chaucer (3)

Continuation of Engl. 434. Second semester.

Mr. Severs

Engl. 436 (236). Bibliography and Methods of Research (3)

A study of the bibliographical tools essential to an advanced student of English literature. Survey of historical, or critical, bibliography, of both printed books and manuscripts; of practical bibliography, including direction in the compilation of a list of books and articles on an assigned subject and in the procedures of thesis writing; and of enumerative bibliography, including an introduction to the chief printed bibliographies of the English language and literature. First semester.

Mr. Severs

SPEECH

Associate Professor H. B. Davis

Assistant Professor Rights

Messrs. Hopkins, Funk, and Mullin

Speech Clinic

For the purpose of diagnosis and treatment of speech defects. Individual instruction provided for students with minor disturbances of voice and speech, as well as those with more serious handicaps. Open to all students in need of corrective treatment and to those desiring speech tests. By appointment. No credit.

Speech 30. Fundamentals of Speech (3)

A foundation course designed to develop knowledge of the basic principles of speech and ability to speak effectively on the platform. Prerequisites: *Engl. 1, 2*. First and second semesters.

Speech 31. Business and Professional Speaking (3)

Development of speech for business and professional problems: technique of expository speaking; use of visual graphics; persuasive speaking applied to the emotional or analytical approach in selling; methods of interviewing; techniques of conference. Prerequisite: *Speech 30*. First and second semesters.

Speech 32. Discussion and Argument (3)

The technique of investigation, analysis, evidence, inference, brief-making, and refutation in oral argument; participation in the various forms of discussion—conference table, panel, and symposium—and in various types of debate—conventional, cross-examination, and direct clash. Students are urged to participate actively in the Debate Society of the University. Prerequisite: *Speech 30*. First and second semesters.

Speech 33. Parliamentary Procedure (1)

Study and drill in modern rules and methods of conducting organized group-deliberation. Prerequisite: *consent of the head of the department*. First semester.

Speech 34. Debate (1)

A study of the principles and techniques of debate, analysis, evidence, reasoning, refutation, briefing, speech composition and delivery skills. Members required to participate in the activities of the Debate Society. Prerequisite: *consent of the head of the department*. First semester.

Speech 51. Radio Workshop (3)

A practical course in the organization and production of radio programs, development of radio voice, and radio techniques, with emphasis on the use

of radio in the fields of journalism, advertising, business, and dramatics; practical experience over local radio station. Prerequisite: *consent of the head of the department*. First and second semesters.

Speech 52. Radio Workshop (3)

Continuation of Speech 51. Second semester.

Speech 61. Dramatics (3)

The practical technique and production of plays; acting, stage-lighting, scenic design and execution, and student direction of plays. Each member must write either an original one-act play or a thesis upon any practical problem of the modern theater. One play is presented each semester.

Speech 62. Dramatics (3)

Continuation of Speech 61.

For Advanced Undergraduates and Graduates

Speech 251 (151). Radio Workshop (3)

A practical course in the organization and production of radio programs, development of radio voice, and radio techniques. Particular attention will be given to the difficulties encountered by those who teach radio or have to produce school programs. Practical experience over local radio station. Prerequisite: *consent of the head of the department*. Summer session.

Mr. Davis

Speech 260 (160). Speech for the Teacher (3)

An orientation course in the field of speech for those engaged in classroom teaching or in directing extra-curricular speech activities. Discussion as a teaching device; integration of speech with other subjects; recognition of common defects of speech; modern emphases in speech contests; individual investigations, report, and conferences. Summer session.

Mr. Davis

Speech 261 (161). Dramatics (3)

A practical course in the production of plays; problems of designing scenic effects, directing, and acting. Particular attention will be given to the difficulties encountered by those who teach dramatics. A production will be given by the class. Summer session.

Mr. Davis

JOURNALISM

Assistant Professor McFadden

Mr. Hutchins

Students majoring in journalism take Journ. 11, 12, 13, 15, 16, 118, and 120. They must also register for and complete at least

four credits in Journ. 1-8, taking it each semester after declaring their major.

At least twenty-four credits of advanced journalism courses (above Journ. 1-8, Brown and White) and a minimum of thirty credits, including Brown and White, are required for graduation. Other requirements include twelve hours to be chosen from the following courses: Journ. 14, 23, 31, 32, or such equivalents as may be allowed; Hist. 25, 26, or 329, 330; Govt. 51, 52; Eco. 3, 4; Soc. 42, 262; and one of the following: Govt. 357; Eco. 111, 113, 233, 234.

In choosing electives, the journalism major is advised to take one or more of such special sequences as: journalism and radio; journalism, business and technical; journalism and government.

The comprehensive examination in journalism includes the contents of courses studied in the sophomore, junior, and senior years.

Journ. 1-8. Brown and White (1)

Enrollment constitutes membership on the staff of the semi-weekly paper. The student elects either editorial or business subdivision, and wins promotion on a merit system. All composition work is for publication. Only students who have completed six semesters of Brown and White are eligible for the top executive posts. Students enrolling for their first semester sign for Journ. 1; for their second semester, Journ. 2; etc. By faculty action this course may be elected each semester for credit in addition to other courses on a student's roster. First and second semesters.

Journ. 11. Newspaper Reporting and Writing (3)

Definition, determinants, and components of news; the lead; news structure and style; sources; interviewing; practice in gathering and writing news about speeches, sports, special features; the readability formula. Prerequisites: *Engl. 1, 2*. First semester.

Journ. 12. Advanced Newspaper Reporting and Writing (3)

Reporting and writing of public affairs, including news of government on the local, county, state, and federal levels; civil and criminal courts; labor, science, and entertainment news. Second semester.

Journ. 13. Newspaper Editing and Copy Reading (3)

Study and practice of newspaper desk work; headline writing, makeup, and typography; selecting, editing and rewriting news and feature copy; use of reference works and morgue. Prerequisite: *Journ. 11*. First semester.

Journ. 14. Press Photography (3)

A study of the fundamentals of news and feature photography; practice in planning and taking pictures, in developing pictures, and in making suitable enlargements for publication; lecture-demonstrations and laboratory assignments in the use of cameras, lights, filters, special lenses, and enlargers. Second semester.

Journ. 15. Editorial Writing (3)

Editorial interpretation of current events; practice in interpretative writing, including editorials, side and follow-up features, the news review, column, newsletter, magazine article; departmentalization. Second semester.

Journ. 16. Newspaper Problems and Policies (3)

Libel, privacy, rights and privileges of the press, ethics, postal regulations, copyright, and crusades; dealing with pressure groups. Second semester.

Journ. 17. Magazine Article Writing (3)

Writing and marketing magazine non-fiction articles from short filler items to full length features as dictated by current market needs; article types; manuscript preparation; illustrating; mailing; market analysis; slanting; editorial contacts; taboos. Prerequisites: Journ. 11 or consent of instructor. First semester.

Journ. 21. Creative Writing (3)

The study and writing of essays and short-stories (and verse, if requested), with a view to developing each student's particular talent. Prerequisites: *Engl. 1, 2*. First semester.

Journ. 22. Creative Writing (3)

Continuation of Journ. 21. Prerequisites: *Engl. 1, 2*. Second semester.

Journ. 23. Editing the House Organ and Trade Publication (1)

A course in selecting copy, in planning layouts, and in handling elementary problems of editing trade magazines. Prerequisites: *Engl. 1, 2, and junior standing*. First semester.

Journ. 25. Radio News Writing (1)

Preparation of news and feature copy for radio newscasting; practice on both local and press association copy. Normally given in conjunction with Speech 51, Radio Workshop. Lecture-recitation and supervised laboratory instruction. Prerequisites: *Journ. 1; Engl. 1, 2*. First semester.

Journ. 26. Radio News Writing (1)

A continuation of Journ. 25. Second semester.

Journ. 31. Community Journalism (3)

An elective for students interested in the small-town weekly field. A study of ethical and legal problems, community news sources, business and promotional problems. Careful examination of community papers which lead in local news coverage, classified advertising, photography, circulation, community service, and local advertising. Laboratory work on community newspapers in this region. First semester.

Journ. 32. Community Journalism (3)

Continuation of Journ. 31. Second semester.

Journ. 43. Writing for Business (3)

Study of and practice in writing business news stories and reports which the business man must prepare; the employee magazine. Prerequisites: *Engl. 1, 2*. First and second semesters.

Journ. 118 (18). History of American Journalism (3)

English background of the American newspaper; development of press from Colonial days to the present; influence of newspaper on American life; contributions of outstanding journalists. Prerequisite: *junior standing*. Second semester.

Journ. 120 (20). Journalism Proseminar (3)

Required of students of senior standing who are majoring in journalism. Survey of the newspaper field in its relation to public affairs. Extensive reading in books, magazines, and newspapers. Second semester.

For Advanced Undergraduates and Graduates

Journ. 201 (101). Modern Newspaper Practice (3)

A course in methods of securing, writing, and editing news. Evaluation and organization of news; study of news sources and values and reader interest; difficulties encountered by faculty advisers of secondary school publications; individual conferences with such advisers. Summer session.

Mr. McFadden

A reference list of new and old numbers will be found at the back of the catalog.

FINANCE

Professor Bradford

Associate Professors Hotchkiss and Jensen

Mr. Perry

Fin. 125 (25). Principles of Corporation Finance (3)

An intensive course covering the fundamentals of corporation finance in one semester. Prerequisite: *Eco. 3*, *Eco. 4*. First and second semesters.

Fin. 126 (26). Problems in Corporation Finance (3)

Continuation of *Fin. 125*. Prerequisite: *Fin. 125*.

Fin. 129 (29). Money and Banking (3)

A general course dealing with the nature and functions of money and commercial banking, monetary and banking development in the United States, the banking process, banking problems, the value of money, international exchange, and monetary and credit policies. Prerequisite: *Eco. 4*. First semester.

Fin. 130 (30). Money and Banking (3)

Continuation of *Fin. 129*. Prerequisites: *Eco. 4*; *Fin. 129*. Second semester.

Fin. 133. (33). Money and Banking (3)

The nature of money and commercial banking, the banking process in the United States, current banking problems, the value of money, and credit policy. Prerequisite: *Eco. 4*. First and second semesters.

Fin. 153 (51). Credits and Collections (3)

A course devoted to the part played by consumer and mercantile credit in modern business, with emphasis upon the place of these types of credit in the economy, credit instruments, sources of credit information, analysis and evaluation of the credit risks, collection methods and procedures, and technical and legal aspects. First semester. Prerequisites: *Acctg. 2 or 104*; *Eco. 4*.

For Advanced Undergraduates and Graduates

Fin. 223 (123). Investments (3)

A study, from the standpoint of the investor, of the various types of corporation and government securities, with special reference to owners' equities, comparative yields, and the machinery of investment, including stock exchange operations. Prerequisite: *Fin. 125*. First semester.

Mr. Hotchkiss

Fin. 224 (124). Investments (3)

A project course in investment analysis for advanced students who are already familiar with investment principles. Sources of data and analysis procedures; the securities of industrials, railroads, public utilities, and municipalities. Prerequisites: *Fin. 223 and consent of the head of the department.* Second semester. Mr. Hotchkiss

Fin. 231 (131). Bank Credit Problems (3)

A course dealing with the problems surrounding the extension of loans to customers and the purchase of open market paper by the individual banker. Legal regulations and restrictions, the instruments of bank credit extension, and the analysis of the bank borrower's credit position will be treated in detail. Prerequisites: *Fin. 130 or 133.* Second semester. Mr. Bradford

Fin. 232 (132). Monetary and Credit Policies (3)

A course devoted to the study of monetary and credit policies of governments and central banks, with special reference to the policies of the United States and the Federal Reserve System in these directions. Theoretical possibilities of credit control will be considered and compared with control policies which are being practiced or have been resorted to by the authorities in the past. Prerequisites: *Fin. 130 or 133.* First semester. Mr. Bradford

Fin. 241 (141). International Trade and Finance (3)

Economic, commercial, and financial relations of nations, including economic organizations, basic principles and practices of international trade, finance, and investment. Prerequisites: *Fin. 130 or 133 or graduate standing and consent of head of the department.* First semester. Mr. Jensen

Fin. 242 (142). International Trade and Finance (3)

Continuation of Fin. 241. Prerequisite: *Fin. 241.* Second semester.

Mr. Jensen

Fin. 251 (151). Public Finance: Federal (3)

A course dealing with government expenditures and revenues, the economics of taxation, and government administration. Prerequisites: *Eco. 4.* First semester. Mr. Perry

Fin. 252 (152). Public Finance: State and Local (3)

The major issues regarding revenues, expenditures, debt and budgeting policy will be examined in the light of fiscal principles and economic effects. Particular attention will be given to current practices in Pennsylvania and contiguous states. Prerequisite: *Fin. 251.* Second semester (Not offered 1951-1952.)

Fin. 254 (154). Fiscal Policy (3)

History and nature of fiscal policy, public debt, national income, full employment proposals and programs. Prerequisite: Fin. 251. Second semester. (Not offered 1951-1952.)

Fin. 271 (171). Readings in Finance (3)

A course of readings in various fields of finance, designed for the student who has a special interest in some field of finance not covered by the regularly rostered courses. Prerequisites: Preparation in Finance acceptable to the head of the department. First semester. Mr. Bradford

Fin. 272 (172). Readings in Finance (3)

Continuation of Fin. 271. Prerequisites: Preparation in Finance acceptable to the head of the department. Second semester. Mr. Bradford

*A reference list of new and old numbers will be found at the back
of the catalog.*

FINE ARTS

Professor Quirk

Mr. Doney

F.A. 3. History of Architecture (3)

The development of architecture from Egypt and Mesopotamia, through Greece and Rome, the early Christian and Romanesque periods to the rise of gothic. First semester.

F.A. 4. History of Architecture (3)

Continuation of F.A. 3. The spread of Gothic architecture, the incoming of the Renaissance, followed by a discussion of succeeding styles, classicism, romanticism, functionalism, the international style, and contemporary movements. Second semester.

F.A. 5. Freehand Drawing (3)

Elementary freehand drawing from nature, still life, and casts with practice in various media. First semester.

F.A. 6. Freehand Drawing (3)

Further practice in expression; color theory with painting in water colors or oils. Second semester.

F.A. 7. Advanced Drawing and Painting (3)

A continuation of the work in F.A. 5 and 6. Prerequisites: F.A. 5, 6; consent of the head of the department. First semester.

F.A. 8. Advanced Drawing and Painting (3)

A continuation of the work in F.A. 5 and 6. Prerequisites: F.A. 5, 6; consent of the head of the department. Second semester.

F.A. 11. Ancient and Medieval Art (3)

An approach to the understanding and enjoyment of the arts: development of art through the ancient and medieval periods; relation between artistic expression and the age which produced it. Lectures. Open to freshmen. First semester.

F.A. 12. The Art of the Italian Renaissance (3)

Painting, sculpture, and architecture are examined as the outgrowth of conditions in Italy during the fourteenth, fifteenth, and sixteenth centuries: the influence of medieval thought and tradition, the awakening interest in nature, the effect of antiquity, especially the stimulus it gave to individual effort. Lectures. Open to freshmen. Second semester.

F.A. 13. The Art of the Northern Renaissance (3)

Art in Europe other than Italy from the fifteenth century to the French revolution; contrasts between native tendencies and foreign influences, especially those of the Italian renaissance, with the resulting struggle between idealism and realism. Lectures. Prerequisites: F.A. 12. First semester.

F.A. 14. Modern Art (3)

The nineteenth and twentieth centuries; historical relationships, underlying theories, and influence of contemporary thought as aids in understanding modern art. The discussions include classicism, romanticism, impressionism, and the various modern schools. Prerequisite: F.A. 11 or 12. Second semester.

F.A. 17. Criticism and Analysis of Art (3)

A critical analysis of the divergent views of the nature of art, its origin and intention. The ancient writers are consulted for views held in Greece and Rome. Factors in molding art opinion in the middle ages; changes in the renaissance. Primarily for majors. Prerequisites: F.A. 11 and 12, or suitable preparation in the history of fine arts, and consent of the head of the department. First semester.

F.A. 18. Criticism and Analysis of Art (3)

Continuation of F.A. 17 with special attention to art criticism since the 17th century. Prerequisite: same as for F.A. 17. Second semester.

F.A. 25. Principles and Practices of Painting (3)

The principles and technique of oil painting. The greater portion of the time is devoted to actual painting from nature. Occasional lectures, illustrated by lantern slides and color reproductions, on composition, technique, color, light, plastic, and special effects, and mood. Primarily for students in the Adult Education Program. Prerequisite: F.A. 5 or 6, or consent of the instructor.

F.A. 26. Creative Painting (3)

The course aims to develop the imaginative and creative powers of the student. Special attention is given to problems of composition. Prerequisites: F.A. 5 or 6, or consent of the instructor.

FRENCH

See Romance Languages

A reference list of new and old numbers will be found at the back of the catalog.

GEOLOGY

Professor Willard

Associate Professors Whitcomb and Gault

Assistant Professors Weitz and G. R. Jenkins

Messrs. Carroll, Bowman, Layman, Lessentine, Lein, Van Alen

Geol. 1. Principles of Geology (3)

An introductory survey of geologic processes. Lectures; laboratory exercises on common minerals, rocks, ores, and fossils; study of topographic maps. First and second semesters.

Geol. 3. Fundamentals of Geology (3)

The origin, history, and economic significance of topographic features, soils, and natural resources; interpretation and construction of topographic maps. Lectures, laboratory. First semester.

Geol. 4. Fundamentals of Geology (3)

Continuation of Geol. 3. Meteorology, climatology, oceanography, and geographical location; factors constituting the natural environment in their effect upon man. Lectures, laboratory, and occasional field trips. Prerequisite: *Geol. 3*. Second semester.

Geol. 6. Engineering Geology (4)

Designed primarily for engineering students. Basic geologic principles; selected minerals, rocks, building materials, geologic structures; applications of geology to such problems as dam sites, tunnels, foundations, highways, underground water, and flood control. Three lectures and one laboratory period or field trip per week. Second semester.

Geol. 12. Historical Geology (3)

The development of the continents and life forms; evolution based on the remains of animal and plant life preserved in the rocks. Lectures, laboratory, and field trips. Prerequisites: *Geol. 1, or 3 and 4*. Second semester

Geol. 31. Mineralogy (3)

The principles of crystallography, with practice in determination of forms of models and crystals; the physical properties, origin, occurrence, association, and alteration of minerals; a study of common mineral species and varieties, with practice in identification based on physical properties. Prerequisite: *Chem. 4 or its equivalent*. First semester.

Geol. 32. Petrology (3)

Macroscopic study of igneous, sedimentary, and metamorphic rocks; their origin, classification, and identification. Prerequisite: *Geol. 31*. Second semester.

Geol. 33. Blowpipe Analysis (1)

The principles of blowpipe analysis of minerals and an introduction to chemical mineralogy, with practice in identification of minerals through chemical methods. To be taken concurrently with Geol. 31. Prerequisite: *Chem. 4 or its equivalent*. First semester.

Geol. 35. Engineering Mineralogy (2)

Elementary crystallography and the occurrence and properties of the common minerals; elements of crystal structure; physical and chemical properties of crystals. Planned for the metallurgical engineering curriculum and for students in chemistry and physics. Prerequisites: *Chem. 4 or its equivalent*. First semester. (Not offered 1951-1952.)

Geol. 43 (143). Cartography (1)

The making and interpretation of maps; photogrammetry and the use of the stereoscope. Field and laboratory. Prerequisite: geology or conservation major. First semester. Messrs. Jenkins, Gault, Whitcomb

Geol. 141. Field Geology (3)

Practice in mapping and field work. Each student is assigned a field problem and is required to prepare a report thereon with geologic map, structure section, and collection of a full set of specimens. Prerequisites: *Geol. 12, 32, 223, 312*. First semester.

Mr. Willard

Geol. 146. Field Problems (3)

Essentially the same in purpose as Geol. 141, though of different content, this course may be taken separately or as a continuation of Geol. 141. Prerequisites: *Geol. 12, 32; Geol. 312, 223* previously or concurrently. Second semester.

Mr. Willard

Geol. 181. Geological Problems (1-4)

Special problems in field, laboratory, and library. Specific work is assigned in individual cases. Prerequisite: completion of substantially all other courses in geology numbered 100-399. Prospective students for this course should consult the department head. First semester.

Messrs. Gault, Jenkins, Weitz, Whitcomb, Willard

Geol. 182. Geological Problems (1-4)

Similar to Geol. 181. Geol. 182 may be elected as a continuation of Geol. 181 or separately. Prerequisites as for Geol. 181. Prospective students should consult the department head. Second semester.

Messrs. Gault, Jenkins, Weitz, Whitcomb, Willard

For Advanced Undergraduates and Graduates

Geol. 223 (121). Structural Geology (3)

The major and minor structures encountered in both the massive and the layered rocks of the earth's crust. Problems of the type encountered in geological, geophysical, and mining work are studied in the laboratory and on field trips. Prerequisites: *Geol. 12, 32*. Second semester. Mr. Weitz

Geol. 255 (151). Mineral Resources (3)

Discussion of world mineral resources, their distribution, occurrence, abundance, reserve supplies; strategic minerals. Lectures, laboratory, and field trips. Prerequisites: *Geol. 12, 32; Geol. 223, 312*. First semester.

Mr. Weitz

Geol. 256 (152). Mineral Resources (3)

Continuation of Geol. 255. Prerequisite: *Geol. 255*. Second semester.

Mr. Weitz

Geol. 311 (111). Palontology (3)

Plant and animal fossils from the morphologic point of view; their use in interpreting geologic history; evolution of the faunas and floras. Lectures and laboratory work. Prerequisites: Geol. 1, or 3 and 4, 12; or Biol. 1, or 31 and 32. First semester. Mr. Whitcomb

Geol. 312 (112). Stratigraphy and Sedimentation (3)

The origin, history, sequence, and correlation of bedded rocks; their fossils, ages, distribution, and structures. Lectures, laboratory, and field trips. Prerequisites: *Geol. 12*; *Geol. 32, 311*. Second semester.

Mr. Willard

Geol. 331 (131). Optical Crystallography (3)

The polarizing microscope and its application in the examination and identification of minerals by the immersion method and in thin section. Prerequisites: *Geol. 12, 32, or consent of department head*. First semester.

Mr. Gault

Geol. 332 (132). Petrography (3)

Microscopic studies of igneous, sedimentary, and metamorphic rocks in thin section. Prerequisite: *Geol. 331*. Second semester.

Mr. Gault

Geol. 342 (142). Field Trip (1)

The spring field trip of several days' duration, is held after mid-semester. The first part of the semester is devoted to literature, reports, and discussions germane to the announced trip. A written summary of the excursion is required of each participant. Offered primarily for geology and conservation majors. Second semester, alternate years with Geol. 344. (Offered 1950-1951.)

Geol. 344 (144). Field Trip (1)

Similar to Geol. 342, but arranged to visit a different region. Prerequisite: geology or conservation major. Second semester, alternate years with Geol. 342. (Offered 1951-1952.)

Geol. 361 (161). Earth Science Applied to Conservation (3)

The application of earth science to problems of conservation: occurrence, economics and exploitation of mineral resources; the hydrologic cycle; hydrometeorology; disposition of precipitated moisture; runoff and discharge; infiltration; occurrence and utilization of surface and ground water resources. Lectures, laboratory and field trips. Prerequisites: *Geol. 12, 32*; *Geol. 271, 272*. First semester.

Mr. Jenkins

Geol. 362 (162). Earth Science Applied to Conservation (3)

Continuation of Geol. 361: fundamentals of soil science (physical, chemical, organic constituents, moisture, morphology and classification); land classification; land utilization problems. Lectures, laboratory and field trips. Prerequisite: *Geol. 361*. Second semester.

Mr. Jenkins

Geol. 371 (171). Meteorology (3)

Principles of meteorology, composition of the atmosphere, physics of the air, weather phenomena, air masses and fronts, wind systems, cyclones and anticyclones, weather instruments and forecasting. First semester.

Mr. Jenkins

Geol. 372 (172). Climatology (3)

Climatologic observations, climatic statistics and problems, world climate types; application of climatology to man's needs and activities. Second semester. Prerequisite: *Geol. 371*.

Mr. Jenkins

For Graduates

Geol. 402 (202). Advanced Physiography (3)

Detailed study of physiographic types and processes. Conferences, reports, with work in the laboratory and field. Second semester. (Offered 1951-1952.)

Mr. Whitcomb

Geol. 411 (211). Advanced Paleontology (3)

Detailed study of selected groups of fossils: generic and specific differences, identifications, descriptions; preparation of fossils; paleoecology. First semester. (Offered 1952-1953.)

Messrs. Whitcomb, Willard

Geol. 412 (212). North American Index Fossils (2)

Study of a limited series of representative North American index fossils, their distinguishing characters, geographic distributions, geologic ranges. Laboratory work supplemented by field excursions to demonstrate stratigraphic paleontology. Second semester. (Offered 1952-1953.)

Mr. Willard

Geol. 413 (213). Applied Stratigraphy (3)

Stratigraphic field problems, laboratory preparation of collected material, megascopic and microscopic studies of sediments. First semester. (Offered 1951-1952.)

Messrs. Gault, Willard

Geol. 414 (214). History of Geology (2)

The growth of geology and geologic thought from the Greeks to the present; the great geologists, their theories, controversies and contributions. Reading, conferences, preparation of reports. Second semester. (Offered 1952-1953.)

Mr. Whitcomb

Geol. 421 (221). Tectonics (3)

The principles of structural geology; nature and origin of minor structures in crystalline and sedimentary rocks; petrofabrics. Conferences, assigned reading, laboratory and field work. First semester. (Offered 1951-1952.)

Mr. Gault

Geol. 432 (232). Advanced Petrography (3)

Advanced work in the use of the petrographic microscope and the universal stage, with reference to rock-forming minerals; microscopic and chemical description and classification of crystalline rocks. Conferences and laboratory work. Second semester. (Offered 1951-1952.) Mr. Gault

Geol. 433 (233). Crystal Structure (2)

Concept of symmetry from the viewpoint of structural crystallography; various types of structures and relations to physical and chemical properties; application of the theory of crystal structure to solid solution exsolution, isomorphism; interpretation of crystal structure data. Assigned reading of literature. Designed for students in physics, chemistry, metallurgy and geology who are interested in X-ray investigation and modern theory of atomic structure. First semester. (Offered 1952-1953.) Mr. Weitz

Geol. 434 (234). Physical Crystallography (2)

An advanced course in the geometrical and physical properties of crystals, with special reference to the Goldschmidt method of crystal measurement and projection. Second semester. (Offered 1952-1953.)

Mr. Weitz

Geol. 441 (241). Geology of Pennsylvania (3-6)

The geology of Pennsylvania and certain other portions of the eastern United States. The stratigraphic sequence embraces the pre-Cambrian, the entire Paleozoic, most of the Mesozoic and Tertiary, the Pleistocene, and recent deposits. Structures are chiefly those of the northern Appalachians. Conferences, reading assignments, preparation of reports, and field trips. First or second semester. May also be arranged to run throughout the year.

Mr. Willard

Geol. 451 (251). Advanced Metallic Economic Geology (3)

Advanced work in ore deposits. Theories of ore deposition, together with detailed work on the type occurrences of some of the metallic or non-metallic minerals; thorough investigation and report on some mining district, with special regard to the origin of the ores and such commercial aspects of the deposits as may depend chiefly on the geology; preparation and microscopic study of specimens of ores. First semester. (Offered 1952-1953.)

Mr. Gault

Geol. 452 (252). Advanced Metallic Economic Geology (3)

Continuation of Geol. 451. Second semester. (Offered 1952-1953.)

Mr. Gault

Geol. 453 (253). Advanced Non-Metallic Economic Geology (3)

Advanced work in non-metallic deposits other than fuels. Theories of formation and details of the more important non-metallic products, with particular attention to Pennsylvania. Each student prepares a report on

some one district or a particular type of deposit. First semester. (Offered 1951-1952.)
Mr. Weitz

Geol. 454 (254). Advanced Non-Metallic Economic Geology (3)
Continuation of Geol. 453. Second semester. (Offered 1951-1952.)
Mr. Weitz

Geol. 481 (281). Geological Investigation (1-6)
The investigation of special problems. Field, laboratory, library work on some limited area; presentation of a report thereon. Geol. 481 may be elected separately from Geol. 482. First semester.
Messrs. Gault, Jenkins, Weitz, Whitcomb, Willard

Geol. 482 (282). Geological Investigation (1-6)
Similar to Geol. 481. May be elected as a continuation of Geol. 481 or separately.
Messrs. Gault, Jenkins, Weitz, Whitcomb, Willard

GEOPHYSICS, ENGINEERING

See Mining Engineering

*A reference list of new and old numbers will be found at the back
of the catalog.*

GERMAN

Professor More

Assistant Professors Lazenby, Schuchard, and Tremper

Ger. 1. Elementary German (3)

Drill in the fundamentals of German grammar; pronunciation; simple conversation and composition; extensive outside reading of simple vocabulary-building texts. No previous study of German required. First and second semesters.

Ger. 2. Elementary German (3)

Continuation of Ger. 1. Prerequisite: *Ger. 1 or the equivalent*. First and second semesters.

Ger. 3. Intermediate German (3)

German prose and poetry; outside reading; composition. Prerequisite: *one year of college German or two units of entrance German*. First and second semesters.

Ger. 4. Intermediate German (3)

Continuation of Ger. 3. Prerequisite: *Ger. 3 or the equivalent*. Second semester.

Ger. 7. Scientific German (3)

Reading of selected texts in the German of science, with particular emphasis on chemistry and physics. Recitations and individual conferences. Prerequisite: *one year of college German or three units of entrance German*. First or second semester.

Ger. 9. Advanced German, Prose and Poetry (3)

Rapid reading of representative texts; collateral reading. Prerequisite: *two years of college German or three units of entrance German*. First semester.

Ger. 10. Goethe's Faust (3)

Study of Part I; lectures on the origin and development of the Faust story; collateral reading. Prerequisite: *Ger. 9 or high standing in Ger. 3, 4, or 7*. Second semester.

Ger. 13 (113). Lessing, Goethe, and Schiller (3)

Prerequisite: *Ger. 10 or the equivalent*. First semester.

Ger. 14 (114). Lessing, Goethe, and Schiller (3)

Continuation of Ger. 13. Prerequisite: *Ger. 10 or the equivalent*. Second semester.

Ger. 22. Conversation and Composition (3)

Review of German grammar; composition and conversation of a more advanced type. Prerequisite: *Ger. 10 or high standing in Ger. 3, 4, or 7*. First or second semester.

For Advanced Undergraduates and Graduates

Ger. 211 (111). Nineteenth Century German Drama (3)

Lectures, reading, reports on assigned work. Prerequisite: *Ger. 10 or the equivalent*. First semester. Messrs. More, Tremper

Ger. 212 (112). Nineteenth Century German Drama (3)

Continuation of Ger. 211. Prerequisite: *Ger. 10 or the equivalent*. Second semester. Messrs. More, Tremper

Ger. 215 (115). The German Short Story (3)

Origin and development. Rapid reading of illustrative stories, with particular attention to Gottfried Keller, Theodor Storm, C. F. Meyer, and Paul Heyse; lectures and reports. Prerequisite: *Ger. 10 or the equivalent*. First semester. Mr. Lazenby

Ger. 216 (116). The German Short Story (3)

Continuation of Ger. 215. Prerequisite: *Ger. 10 or the equivalent*. Second semester. Mr. Lazenby

GOVERNMENT

See History and Government

A reference list of new and old numbers will be found at the back of the catalog.

HISTORY AND GOVERNMENT

Professors Harmon, Gipson, Schulz, and Aiken

Assistant Professors Peck, Cowherd, Kyte, and Tresolini

Messrs. Haight, Howatt, Daniel, Taylor, and McMullen

HISTORY

Hist. 11. Development of Western Civilization (3)

The roots of Western civilization; the evolution of economic, social, and political institutions; the impact of scientific and technological developments; the influence of major trends of thought. Required of all freshman engineering students. First semester.

Hist. 12. Development of Western Civilization (3)

The modern Western world; the rise of the nation-state; the **occident** and the **orient**; the rise and decay of the older imperialisms; the role of science and idealism in both peace and war in the twentieth century. Required of all freshman engineering students. Second semester.

Hist. 13. United States History (3)

The era of constitution-making; the evolution of political parties; foreign relations during the wars of the French revolutionary period; the western movement and western state-building; the growth of sectionalism. First semester.

Hist. 14. United States History (3)

The war for the Union; the reconstruction of the South; the era of big industry and labor combinations; the United States as a world power; the new national paternalism. Second semester.

Hist. 25. European History (3)

A rapid survey of the major historic forces from the collapse of the Roman Empire to the sixteenth century; the cultural aspects of medieval society. First semester.

Hist. 26. European History (3)

Continuation of Hist. 25. A detailed account of historic developments from the sixteenth to the nineteenth centuries. Second semester.

Hist. 27. European Expansion and Empire-Building, 1492-1700 (3)

Aspects of the phenomenon of the spread of European civilization and empire into the continents of America, Asia, and Africa. First semester.

Hist. 28. European Expansion and Empire-Building, 1700 to the Present (3)

The rivalry of imperial systems; the disappearance of French power in the New World; the movements for independence of the English, Spanish and Portuguese colonials. Second semester.

Hist. 29. Modern Europe (3)

The study of revolution and reaction in western Europe between 1789 and 1870. Emphasis is laid upon the birth, growth, and spread of nineteenth-century liberal doctrines as well as upon the attempts made to stifle that growth by every political and diplomatic means available. First semester.

Hist. 30. Modern Europe (3)

A study of contemporary Europe; the origins and consequences of two World Wars; the rise of revolutionary governments in Italy, Germany, and Russia. Second semester.

Attention is called also to the following courses in history offered by other departments: Eco. 1, Industrial Evolution; Gk. 21, Ancient History; Lat. 22, Ancient History; Gk. 183, The Economic and Social Life of the Romans; Lat. 184, The Economic and Social Life of the Romans.

For Advanced Undergraduates and Graduates

Hist. 251 (151). A Pro-Seminar in United States and Pennsylvania History for Teachers (3)

This course is designed to meet the certification requirements of the Pennsylvania State Council of Education, that all teachers in the public schools should have a course in United States history in which particular emphasis is placed upon the history of Pennsylvania. The following topics will be stressed in the pro-seminar: American colonization; racial origins; the beginnings of agriculture, industry and commerce; the expansion of the frontiers; the movement for independence; constitution-framing; the party system of government; cultural tendencies and progress toward social betterment; the problem of states' versus national rights; the era of great industry. Summer session.

Mr. Harmon

Hist. 315 (115). Political and Social History of England (3)

The history of the rise and growth of English political and social institutions prior to 1603. First semester.

Messrs. Aiken, Cowherd

Hist. 316 (116). Political and Social History of England (3)

The history of the development of English political and social institutions from the death of Elizabeth to the present. Emphasis is placed upon the political and intellectual legacy bequeathed to the modern world as a result of this development. Second semester.

Messrs. Aiken, Cowherd

Hist. 317 (117). The Middle East in World History (3)

A survey of the rise of civilization in the Middle East from the times of earliest recorded history until the capture of Constantinople by the Turks in 1453, with special emphasis upon the legacy of Egypt, Persia, and the Hebrew people; oriental and western ideas during Hellenistic and Roman times; rise of Byzantium; rise of Islam and the development of Islamic civilization; Crusades and final triumph of the Ottoman Turks. First semester.

Mr. Aiken

Hist. 318 (118). The Middle East in World History (3)

Continuation of Hist. 317. The relations between Europe, America, and the Middle East during the heyday and decline of Ottoman power; western imperialism in the Middle East; Zionism; the strategic importance of this great land bridge between the three continents in modern times to the present day, including the struggle for the control of communications by land, sea, and air, and the control of the vast petroleum reserves in this area. Second semester.

Mr. Aiken

Hist. 319 (119). Eighteenth Century European Civilization (3)

This course is concerned with eighteenth-century European civilization. The constitutional, political, economic and social developments within, and institutions of the more dynamic European states of Great Britain, France, Prussia, and Russia will be contrasted and compared. First semester.

Mr. Kyte

Hist. 320 (120). Eighteenth Century European Imperialism (3)

This course is concerned with eighteenth-century imperialism. The constitutional, political, economic and social developments within, and institutions of the New World empires of Great Britain, France, Spain, and Portugal when at the height of their power will be contrasted and compared. Second semester. Mr. Kyte

Hist. 327 (127). Development of American Institutions (3)

The colonial origin and national expansion of social, cultural, religious and economic institutions to 1865. First semester. Mr. Cowherd

Hist. 328 (128). Development of American Institutions (3)

A continuation of History 327. Developments from the Civil War to the present, with emphasis on industrialization, urbanization, the populist and progressive movements, and social changes as factors in institutional development. Second semester. Mr. Cowherd

Hist. 329 (129). American Foreign Policy (3)

The French alliance; independence and boundaries; commercial restrictions; French Revolution and neutrality; purchase of Louisiana; War of 1812; acquisition of Florida; Monroe Doctrine; relations with France and Great Britain; Oregon and Texas; the Mexican War. First semester.

Mr. Harmon

Hist. 330 (130). American Foreign Policy (3)

The Civil War and possible European intervention; Alaska boundary; War with Spain; the new Caribbean policies; the World War of 1914-1918 and its aftermath; diplomatic events preceding Pearl Harbor; outbreak and prosecution of the war; plans for peace. Second semester.

Mr. Harmon

Hist. 331 (131). The Intellectual Expansion of Modern Europe, 1300 to 1789 (3)

A study of the heritage bequeathed to modern Europe by the cultural achievements and traditions of the Renaissance, Reformation, and the 17th and 18th centuries. Special attention will be paid to scientific and technological development and to the growth of political thought and theory during these centuries. First semester. Mr. Peck

Hist. 332 (132). The Intellectual Expansion of Modern Europe, 1789 to the Present (3)

A continuation of the preceding course from the time of the French Revolution to the present, with special attention paid to the effect upon modern thought of the industrial revolution and the rapid advancement in technology. Second semester. Mr. Peck

Hist. 341 (141). Expansion of the English-speaking Peoples, 1100 to 1775 (3)

A study of the political, economic, and social implications of the expansion of the English-speaking peoples throughout the world from the time of the Crusades to the time of the American Revolution. First semester. Mr. Aiken

Hist. 342 (142). Expansion of the English-speaking Peoples, 1775 to the Present (3)

A study of the political, economic, and social growth of the English-speaking communities throughout the world from the time of the American Revolution to the outbreak of the World War II. Second semester. Mr. Cowherd

Hist. 349 (149). Hispanic America in the Nineteenth Century (3)

Successful movements for independence and recognition; types of governments formed in South, Central, and Caribbean America; wars and revolutions; problems pertinent to foreign trade; application of the Monroe Doctrine and its acceptance. First semester. Messrs. Harmon, Kyte

Hist. 350 (150). Hispanic America in the Twentieth Century (3)

Continuation of Hist. 349. Results of the Spanish-American War; Theodore Roosevelt and "big stick" diplomacy; Panama Canal and world trade; debts and interventions; Pan-Americanism; World War and its influence; recent United States relations with Latin America. Second semester. Messrs. Harmon, Kyte

Hist. 360 (160). History of American Political Parties (3)

Evolution of major and minor political parties, including the Federalist and Anti-Federalist, the Democratic and Republican, the Populist and Progressive; party organization and functions; the economic and sectional basis of politics; nomination and election methods; the conduct of campaigns. Summer session. Mr. Harmon

For Graduates

Graduate students desiring to major in history and government should have had at least twelve semester hours of undergraduate work that bear upon this field or in other ways should satisfy the department that they are in a position to undertake profitably the required program of study.

Candidates for the master's degree may qualify either by completing successfully thirty hours of approved course work and passing an examination covering the entire field or by completing twenty-four hours in approved courses and submitting a satisfactory thesis. Each candidate will select, upon the advice and with

the approval of the head of the department, the plan better suited to his needs and abilities.

All graduate students majoring in history and government are expected to take Hist. 401 (227) and 402 (228), Research Methods in the Social Sciences.

Hist. 401 (227). Research Methods in the Social Sciences (3)

Technique of research along the lines of historical method; training in the critical handling of documentary materials, in measuring the value of evidence, and in formal presentation of the results of research. Required of all graduate students in history and government. First semester.

Messrs. Harmon, Kyte

Hist. 402 (228). Research Methods in the Social Sciences (3)

In this course the emphasis will be placed upon historiography. Second semester.

Messrs. Harmon, Kyte

Hist. 403 (219). Modern Europe, 1789-1870 (3)

Era of Metternich; Congress of Vienna and reconstruction of Europe; industrial revolution and subsequent social reforms; France and Germany; democracy and nationalism; Second French Empire; unification of Italy and Germany. First semester.

Messrs. Kyte, Peck

Hist. 404 (220). Modern Europe since 1870 (3)

Latin and Teutonic Europe; Great Britain and Ireland; Russia and the Dardanelles; Turkey and Europe; nationalism and the new imperialism; World War I and the Treaty of Versailles; League of Nations; national socialism vs. democracy; thirst for power; World War II and its aftermath. Second semester.

Messrs. Kyte, Peck

Hist. 411. England under the Tudors (3)

An intensive study of political, institutional and social history during the period 1485-1603. First semester.

Mr. Aiken

Hist. 412. England under the Stuarts (3)

An intensive study of religious, political, institutional and social history during the period 1603-1760. Second semester.

Mr. Aiken

Hist. 413. Modern England-The Age of Reform, 1760-1890 (3)

A study of industrial England, liberal and humanitarian reforms, and the growth of colonial self-government. First semester.

Mr. Cowherd

Hist. 414. Modern England-The Age of Conflict, 1890-to the present (3)

The growth of socialism, the rise of the Labor Party, the expansion of

empire, formation of the Commonwealth, and the origins and consequences of two World Wars will be studied. Second semester.

Mr. Cowherd

Hist. 421. English Colonization in North America in the Seventeenth Century (3)

The activities of the overseas trading companies, proprietors, and royal governors, and the founding and development of the English colonies in the West Indies and along the shores of North America. First semester.

Messrs. Gipson, Kyte

Hist. 422. America in the Eighteenth Century (3)

A continuation of Hist. 421, with emphasis upon the workings of the mercantile system, the evolution of colonial institutions, the development of imperial administration, and the causes, events, and results of the wars with France and the War for American Independence. Second semester.

Messrs. Gipson, Kyte

Hist. 423 (215). American Constitutional History (3)

The major problems involved in the growth of the powers of the national government. First semester.

Messrs. Cowherd, Harmon

Hist. 424 (216). American Constitutional History (3)

Continuation of Hist. 423. Second semester. Messrs. Cowherd, Harmon.

Hist. 425 (245). The United States, 1776-1800 (3)

Revolutionary movement and the Revolution; patriots and loyalists; diplomats and diplomacy; early state constitutions and the Articles of Confederation; Constitutional Convention of 1787 and the Constitution; Federalists in control; plots and conspiracies; rise of the Republican party; downfall of the Federalists. First semester.

Mr. Harmon

Hist. 426 (246). The United States, 1800-1850 (3)

Jeffersonian democracy; territorial expansion; War of 1812; new nationalism; sectionalism; protective tariffs; slavery and expansion; Texas; Mexican War; compromise measures of 1850. Second semester.

Mr. Harmon

Hist. 427 (247). The United States, 1850-1898 (3)

Background of the Civil War; rise of the Republican party; Buchanan's policy; election of 1860; Lincoln's attitude; views of Northern and Southern leaders; war powers of the President; downfall of the Confederacy; reconstruction; Grant's administration; big business; organized labor; granger movement; Bryan and silver; Cuba and Spain. (Not offered 1951-1952.)

Mr. Harmon

Hist. 428 (248). The United States since 1898 (3)

Causes and results of the Spanish-American War; insular possessions; Theodore Roosevelt's policies; Progressive movement; Wilson and re-

form; World War I; speculative 1920's; the great depression; Democrats in control; Franklin D. Roosevelt's domestic and foreign policies; aftermath of World War II. (Not offered 1951-1952.) Mr. Harmon

Hist. 431 (217). America as a World Power (3)

The results of the Spanish-American War; the United States' Pacific possessions; Theodore Roosevelt and world affairs; Knox and "Dollar Diplomacy"; World War I; American neutrality; the United States as a belligerent; the Treaty of Versailles. First semester. Mr. Harmon

Hist. 432 (218). America as a World Power (3)

The United States and the League; the reconstruction of Europe; the rise of Hitler; World War II and its aftermath; the Monroe Doctrine; the "Good Neighbor Policy"; the problems of the Pacific: China and Japan; Japan and the United States; the War with Japan; Red China and the Korean crisis. Second semester. Mr. Harmon

GOVERNMENT

Govt. 1. The Foundations of Government (3)

A survey of the basic problems of governmental organization and operation, with emphasis on controversial issues and on the relevant political institutions and practices, both contemporary and past, of American, European, and Asiatic peoples. First and second semesters.

Govt. 2. American Political Ideas (3)

A survey of the ideas underlying and associated with the political institutions and practices of the United States. Prerequisite: Govt. 1. Second semester.

Govt. 3. Foreign Governments (3)

The governmental systems of selected foreign countries, including Great Britain, Russia, France, Germany, and Japan. Prerequisite: Govt. 1. First semester.

Govt. 4. Political Parties and Electoral Problems (3)

The organization, functions, and techniques of political parties; pressure groups and pressure politics; nomination and election methods. Prerequisite: Govt. 1. Second semester.

Govt. 51. American National Government (3)

Constitutional principles; organization and operation of the national government; the party system; citizenship and civil rights. Prerequisite: sophomore standing. First semester.

Govt. 52. American State and Local Government (3)

The position of the states in the union; machinery and functions of state governments; nominations and elections; the various systems of local government. Prerequisite: sophomore standing. Second semester.

For Advanced Undergraduates and Graduates

Govt. 351 (151). Constitutional Law (3)

The law of the Constitution as expounded by the Supreme Court of the United States. First semester. Messrs. Schulz, Tresolini

Govt. 357 (157). City Government (3)

The machinery and processes of city government in the United States; city-state and federal-city relations; the problems of metropolitan areas; forms of city government, with special emphasis on the operation of the council-manager plan. First semester. Mr. Schulz

Govt. 360 (160). Public Administration (3)

The nature of administration; problems of organization and management; public personnel policies; budgeting and budgetary systems; forms of administrative responsibility. Second semester.

Messrs. Schulz, Tresolini

Govt. 363 (163). Contemporary Political Thought (3)

Analysis of the basic concepts of political science: state, government, sovereignty, law, liberty, rights; consideration of authoritarian and popular government; federal and unitary systems. First semester. Mr. Schulz

Govt. 364 (164). Contemporary Political Thought (3)

Theories concerning the proper rôle of the State in society and the ethical justification of political coercion; political aspects of anarchism, communism, socialism, fascism, and political pluralism. Second semester.

Mr. Schulz

For Graduates

Govt. 451 (251). American Political Institutions (3)

The federal and state constitutions; Congress and the state legislatures; the presidency; state governors; the judicial system; political parties; nomination and election methods; local government; the council-manager plan. First semester. Mr. Tresolini

Govt. 452 (252). American Political Institutions (3)

Continuation of Govt. 451. Second semester.

Mr. Tresolini

Govt. 463 (263). Seminar in Political Theory (3)

Consideration of theories concerning the nature of the state, its origin, and its role in society. Prerequisites: Govt. 363, 364. First semester.

Mr. Schulz

Govt. 464 (264). Seminar in Political Theory (3)

Continuation of Govt. 463. Prerequisites: Govt. 363, 364, 463. Second semester.

Mr. Schulz

A reference list of new and old numbers will be found at the back of the catalog.

INDUSTRIAL ENGINEERING

Professor Stuart

Associate Professor Gould

Assistant Professor Beauchamp

Messrs. Ramberg, Bastian, Kane, Isken

I.E. 13. Elementary Industrial Engineering (3)

The development of modern industry and its components, with attention to the engineering and economic problems. Lectures, problem exercises, trips and collateral reading. Prerequisite: *sophomore standing*. First and second semesters.

I.E. 100 (1). Industrial Employment

Following the junior year, students in the industrial and mechanical engineering curriculum are required to do a minimum of eight weeks of practical work, preferably as student apprentices, in the work they plan to follow after graduation. A report, typewritten and bound, is required. Prerequisite: *sophomore standing*.

I.E. 102 (2). Industrial Management (3)

A course in the essential problems of organization and management of industrial enterprises. Planned for students other than those in mechanical and industrial engineering. Prerequisites: *Eco. 3, 4*. First semester.

I.E. 103 (3). Industrial Management (3)

Continuation of I.E. 102. Prerequisites: *Eco. 3, 4*. Second semester.

I.E. 105 (5). Thesis (3)

Candidates for the bachelor's degree in industrial engineering may, with the approval of the department staff, undertake a thesis as a portion of the work of the senior year.

I.E. 114 (14). Plant Administration (3)

The physical plant, its organization, and operation. Lectures, problem exercises, trips, and collateral reading. Prerequisite: *I.E. 13*. First semester.

I.E. 115 (15). Personnel Administration (3)

Industrial personnel, their selection, training, care, and reward. Lectures, problem exercises, trips and collateral reading. Prerequisite: *Junior standing*. Second semester.

For Advanced Undergraduates and Graduates

I.E. 321 (121). Experimental Industrial Engineering (3)

Experimental projects in selected fields of industrial engineering, approved by the instructor. A written report is required. Prerequisite: *senior standing in industrial engineering and consent of the instructor*.

Messrs. Gould, Ramberg, Bastian, Kane

I.E. 322 (122). Experimental Industrial Engineering (3)

Continuation of I.E. 321. Prerequisite: *senior standing in industrial engineering and consent of the instructor*.

Messrs. Gould, Ramberg, Bastian, Kane

I.E. 325 (125). Production Control (3)

The coördination of an industry's activities to produce its commodities in sufficient quantity, of proper quality, and at the right time, for the least possible cost. Lectures, problem exercises, trips, and term project. Prerequisite: *I.E. 114 and senior standing*. First semester.

Messrs. Gould, Beauchamp

I.E. 326 (126). Quality Control (3)

Industrial inspection methods; interpretation of results, based upon statistical techniques for improvement of product quality, for better coördination between design, production, and inspection, and for reduction of cost. Lectures, problem exercises, trips, and term project. Prerequisites: *I.E. 114, Math 233, and senior standing*. Second semester.

Messrs. Beauchamp, Isken

I.E. 327 (127). Product Engineering (3)

The relationship and application of modern industrial processes, materials, and machines to product design for improvement of production, efficiency, product life, and consumer acceptance. Lectures, problem exercises, trips and term project. Prerequisites: *I.E. 114, senior standing, and consent of the instructor*. First semester.

Mr. Ramberg

I.E. 328 (128). Work Simplification (3)

Process and product simplification, involving method study, time study, and other analysis techniques. Lectures, problem exercises, trips, and term project. Prerequisites: *I.E. 114 and 115, and senior standing*. Second semester.

Messrs. Bastian, Ramberg, Kane

I.E. 329 (129). Wage and Salary Administration (3)

The theory and practice of job evaluation, employee merit rating, and community wage surveys for the purpose of establishing salary levels which provide proper payment for various jobs, reward individual effort and merit, and meet competition. Prerequisites: *I.E. 115 and senior standing*. First semester. Mr. Gould

I.E. 330 (130). Industrial Relations (3)

The policies, organization, and operation of an industrial relations department, based upon existing governmental regulations and current policies of organized labor. Lectures, problem exercises, and term project. Prerequisites: *I.E. 115, Eco. 233, and senior standing*. Second semester. Mr. Gould

For Graduates

Candidates for the degree of Master of Science with a major in Industrial Engineering shall include eighteen hours of courses on the "400" level. Of these eighteen hours, twelve shall be in the major field and six may be in other branches of engineering. Upon the consent of the departments concerned, Psych. 405 and Psych. 406, Seminar in Applied Psychology, may be considered in the major field. Collateral courses shall be confined to engineering, business administration, and psychology.

I.E. 400 (200). Management Policies (3)

Analysis of the factors entering into the determination of management policies; discussion of case material bearing upon the organization, location, growth, size, socialization, and control of types of industries. First semester. Mr. Gould

I.E. 402 (201). Personnel Policies (3)

Analysis of the factors entering into the determination of personnel policies; discussion of case material bearing on the worker and his relation to industry. Second semester. Mr. Gould

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INTERNATIONAL RELATIONS

Professor Godshall
Visiting Professor E. H. Miller
Assistant Professor Dunlap
Messrs. Williamson, Christie, Needles

Int. Rel. 1. Diplomacy (3)

Scrutiny of the methods and objectives of diplomacy, with particular

emphasis upon illustrative examples drawn from contemporary and documentary materials portraying negotiations and policies as actually pursued by statesmen striving for position and power. First semester.

Int. Rel. 2. Diplomacy (3)

Continuation of Int. Rel. 1. Second semester.

Int. Rel. 11. The Diplomacy of Europe 1850-1919 (3)

The development of alliances and other associations of nations, with resultant tensions and frictions; the causes of successive wars; the character of peace settlements. First semester. (Offered Summer 1951.)

Int. Rel. 12. The Diplomacy of Europe since 1919 (3)

Continuation of Int. Rel. 11. Second semester. (Offered Summer 1952.)

Int. Rel. 21. The Diplomacy of the Far East to 1919 (3)

The opening of China and Japan; the transformation of Japan; the partition of China; international rivalries in Korea, Manchuria, the Philippines, Southeastern Asia and the Indies; economic and territorial imperialism. First semester.

Int. Rel. 22. The Diplomacy of the Far East since 1919 (3)

An analysis of recent and contemporary political and economic problems confronting not only the countries of the Orient but the Western powers with interests in that region; Japan's aspirations to establish a "New Order in Greater East Asia"; frustration and remotivation of Japan; the spread of communism and its consequences; prerequisites for peace and security in the Far East and the Pacific region. Second semester.

Int. Rel. 133 (31). The Diplomacy of Russia and the Middle East to 1919 (3)

The growth of Tzarist power and influence, impinging upon weaker states and affecting the holdings of other great powers. First semester.

Int. Rel. 134 (32). The Diplomacy of Russia and the Middle East since 1919 (3)

The effect of the ascension of Soviet power and influence upon neighboring and other states. Second semester.

For Advanced Undergraduates and Graduates

Int. Rel. 312 (112). World Affairs Since 1919 (3)

The peace treaties of 1919; ideals and realities of the League of Nations, efforts to effect disarmament; resurgence of power politics as displayed by the German-Italian-Japanese Axis; appeasement; frustration;

the war of 1939-1945; post-war occupation of Axis countries; problems of reconciliation of conflicting objectives and interests among the victors. (Offered Summers only.) Messrs. Miller, Godshall

Int. Rel. 322 (122). The Far East in World Affairs (3)

Japanese and other quests for hegemony through extension of influence and control; decline of Western prestige and power; movements toward independence; nationalism; the struggle of China against internal and external enemies. (Offered Summers only.) Messrs. Miller, Godshall

Int. Rel. 332 (132). Russia in World Affairs (3)

An appraisal of the objectives and tactics of Soviet diplomacy, with particular emphasis upon Russian status as one of the great powers. (Offered Summers only.) Messrs. Dunlap, Miller

Int. Rel. 341 (141). International Relations (3)

Basic factors contributing to contemporary friction; elements of international cooperation in dealing with historic and current issues of international politics. First semester. Messrs. Godshall, Dunlap

Int. Rel. 342 (142). International Relations (3)

Continuation of Int. Rel. 341. Second semester. Messrs. Godshall, Dunlap

Int. Rel. 351 (151). International Organization (3)

Constitutional and political character of successive agencies of international organizations, with emphasis upon the League of Nations, First semester. Messrs. Godshall, Dunlap

Int. Rel. 352 (152). International Organization (3)

Continuation of Int. Rel. 351, with emphasis upon the United Nations. Second semester. Messrs. Godshall, Dunlap

Int. Rel. 361 (161). International Law (3)

Consideration of the principles and rules generally recognized as binding upon the community of nations in time of peace; recognition of the existence and termination of states; nationality and protection of persons; acquisition and loss of territory; control over territorial waters; piracy; asylum; state responsibility and international claims. First semester. Messrs. Dunlap, Miller

Int. Rel. 362 (162). International Law (3)

Principles applicable to the conduct of hostilities in wartime; rules of war; treatment of prisoners; transfer of property; establishment and disposition of "war guilt"; recognition of governments instituted by force; problems of neutrality. Second semester. Messrs. Dunlap, Miller

For Graduates

Candidates for the master's degree may qualify either by completing successfully thirty hours of approved course work in this and cognate departments and passing an examination covering the entire field or by completing twenty-four hours in approved courses and submitting a satisfactory thesis. Each candidate will select the plan better suited to his needs and abilities, upon the advice and with the approval of the head of the department, and may be required to take a comprehensive written and oral examination.

Int. Rel. 441 (241). Seminar in International Relations (3)

Intensive analysis of selected forces and problems of world politics. First semester. Messrs. Godshall, Dunlap

Int. Rel. 442 (242). Seminar in International Relations (3)

Continuation of Int. Rel. 441. Second semester. Messrs. Godshall, Dunlap

Int. Rel. 451 (251). Seminar in International Organization (3)

Intensive analysis of selected agencies and activities of the League of Nations and affiliated institutions. First semester. Messrs. Godshall, Dunlap

Int. Rel. 452 (252). Seminar in International Organization (3)

Continuation of Int. Rel. 451 with emphasis upon the United Nations. Second semester. Messrs. Godshall, Dunlap

Int. Rel. 461 (261). Seminar in International Law (3)

Intensive analysis of the principal theories concerning the nature of international law and its fundamental conceptions, with special studies of their application and significance in contemporary international society. First semester. Messrs. Dunlap, Miller

Int. Rel. 462 (262). Seminar in International Law (3)

Continuation of Int. Rel. 461. Second semester. Messrs. Dunlap, Miller

JOURNALISM

See English

LATIN

See Classical Languages

LAW

See Accounting

A reference list of new and old numbers will be found at the back of the catalog.

MATHEMATICS AND ASTRONOMY

Professors Raynor, Smail, Shook, and Pitcher

Associate Professors Lamson, Cutler, Latshaw, Stoll, and Beale

Assistant Professors VanArnam, Hailperin, Chellevold,
Wilansky, and Blakers

Messrs. Seebald, Spohn, Samoloff, Kenny, Snyder
Goldberg, Schecter, Lane, Schwegler, and Smurthwaite

In the department of mathematics and astronomy undergraduate majors are offered in mathematics, in mathematics and astronomy, and in actuarial science. For details of the requirements see the outline of major sequences in the section describing the College of Arts and Science.

MATHEMATICS

Math. 1. Plane Trigonometry (3)

First semester.

Math. 1b. General Mathematics for Students of Business (3)

Review of elementary algebra; graphs and charts, the straight line law, the law of the parabola; logarithms; arithmetic and geometric progressions; the exponential law, the power law; curve fitting, permutations, combinations, and probability. First and second semesters.

Math. 11. Analytic Geometry and Beginning Calculus (3)

The straight line; conic sections; rational fractional functions; trigonometric curves; transformation of coordinates; derivatives, geometrical and physical applications; differentiation of explicit algebraic functions; the indefinite integral; integration of polynomials, applications; progressions; binomial theorem; complex numbers; theory of equations. Prerequisite: *Math. 1 or entrance credit in plane trigonometry.* First and second semesters.

Math. 12. Elementary Differential and Integral Calculus (3)

Differentiation of algebraic functions; higher derivatives; maxima and minima; differentials; indefinite integrals; definite integrals; geometrical and physical applications; differentiation of transcendental functions. Prerequisite: *Math. 11*. First and second semesters.

Math. 13. Calculus and Solid Analytic Geometry (3)

Hyperbolic functions; polar coordinates; curvature; curvilinear motion; technique of integration; further geometrical and physical applications; solid analytic geometry. Prerequisite: *Math. 12*. First and second semesters.

Math. 14. Calculus and Elementary Differential Equations (3)

Approximate integration; improper integrals; indeterminate forms; Taylor's formula with remainder; infinite series; partial derivatives; multiple integrals; elementary differential equations. Prerequisite: *Math. 13*. First and second semesters.

Math. 15. Reading Course in Mathematics (1)

Credit not to exceed one hour per semester, total credit not to exceed three hours; approval of program and written report required. Prerequisite: consent of the head of the department. First and second semesters.

Math. 16. Solid and Spherical Geometry and Spherical Trigonometry (3)

Open to all students, particularly advised for students of astronomy. Given when there is sufficient demand. First semester.

Math. 23. General Mathematics for Students of Business. Second Course (3)

Fundamental ideas of analytic geometry and calculus, and selected topics of algebra, with numerous applications to problems of business and the social sciences. Prerequisite: *Math. 1b*. Second semester.

Math. 40. Mathematics of Finance (3)

Compound interest, and elementary treatment of annuities, etc. Prerequisite: *Math. 1b or 11*. Second semester.

Math. 42. Introduction to Mathematics of Statistics (3)

Frequency tables; averages; probability; the normal curve; sampling theory; correlation theory in two-way space. Prerequisite: *Math. 1b* or consent of the instructor. Second semester.

Math. 43. First Course in Mathematics of Life Insurance (3)

Mathematical theory of life contingency; preparation of life and monetary tables; computation of premiums for various life insurance policies;

valuation of policies to meet statutory requirements; mathematical theory of risk and cost of insurance; computation of items for annual reports; valuation of life annuities. Prerequisite: *Math. 40*. First semester.

Math. 51. Advanced Algebra (3)

Complex numbers; theory of equations, with applications to classical problems, Sturm's theorem, etc.; determinants; the theory of resultants. Prerequisite: *Math. 12*. First semester.

Math. 54. Higher Geometry (3)

An introductory course in projective geometry and non-euclidean geometry. Prerequisite: *Math. 13, previously or concurrently*. Second semester.

Math. 102. Finite Differences (3)

Definition of differences of various orders; the operators Δ and E ; interpolation formulas for both equal and unequal intervals; central difference interpolation formulas; inverse interpolation; finite summation; differences of zero; relations between the operators Δ and D ; differences of a product; finite summation by parts; some modern extensions and special devices for interpolation and summation; numerous examples illustrating the use of the theory. Prerequisites: *Math. 14*; *Math. 40* and *43*. First or second semester. Mr. Beale

Math. 123. Probability (3)

A course designed primarily for students majoring in actuarial science. Prerequisite: *Math. 14*. First semester. Mr. Beale

For Advanced Undergraduates and Graduates

Math. 206 (106). Advanced Calculus (3)

Partial differentiation and implicit functions; elementary vector algebra and calculus; curvilinear coordinates; line and surface integrals; gradient; divergence; divergence theorem; Green's theorems, Stokes' theorem; geometrical and physical applications; Fourier series. Students may not receive credit for both *Math. 206* and *Math. 207*. Prerequisite: *Math. 14*. First and second semesters. Messrs. Blakers, Cutler, Goldberg, Hailperin, Lamson, Latshaw, Pitcher, Raynor, Shook, Smail, Stoll, Wilansky

Math. 207 (107). Advanced Calculus (3)

Solution of linear equations, determinants; infinite series; summation of finite and infinite series; Fourier series; ordinary differential equations, linear operators, solutions in series; physical applications; gamma, Bessel and Legendre functions. Designed for students of Electrical Engineering. Students may not receive credit for both *Math. 206* and *Math. 207*. Prerequisite: *Math. 14*. First and second semesters.

Messrs. Blakers, Cutler, Goldberg, Hailperin, Lamson, Latshaw, Pitcher, Raynor, Shook, Smail, Stoll, Wilansky

Math. 219 (109). Principles of Analysis (3)

The real number system; limits; continuous and discontinuous function; differentiation; integration; infinite series; absolute and uniform convergence; functions of more than one variable; implicit functions. Required of majors in mathematics except majors in actuarial science. Prerequisite: *Math. 14*. First semester. Mr. Hailperin

Math. 220 (110). Principles of Analysis (3)

Continuation of Math. 219. Required of majors in mathematics except majors in actuarial science. Second semester. Mr. Hailperin

Math. 221 (111). Differential Equations (3)

Special solvable non-linear equations, linear equations, transformations, and symbolic methods; solutions in series; Ricatti's, Bessel's, and Legendre's equations. Prerequisite: *Math. 14*. First semester.

Messrs. Cutler, Shook

Math. 233 (131). Mathematical Statistics (3)

Moments; moment generating function; normal distribution function; Poisson distribution function; large sample theory of a single variable; linear regression and linear correlation; distribution functions of two variables; small sample distributions; the chi square distribution; Student's *t* distribution. Prerequisite: *Math. 14*. Second semester. Mr. Latshaw

Math. 301 (101). Vector Analysis (3)

The theory and method of vector analysis as applied in physics and pure mathematics. Prerequisite: *Math. 14*. First semester. Messrs. Latshaw, Shook

Math. 303 (103). Mathematical Logic (3)

An introductory course in symbolic logic designed primarily to acquaint the student with the principles of reasoning used in mathematics. Prerequisites: Senior standing, or consent of the instructor. First or second semester. Mr. Hailperin

Math. 315 (115). Theory of Functions of a Complex Variable (3)

Algebra of complex numbers; analytic functions; Cauchy-Riemann equations; Laplace's equation; conformal mapping; integrals of complex functions; Cauchy's theorem; power series; Taylor's theorem; Laurent's theorem; residues; applications to physical and geometrical problems. Prerequisites: *Math. 206*, or *Math. 219 and 220*. First semester.

Messrs. Shook, Smail

Math. 322 (112). Differential Equations and Harmonic Analysis (3)

Continuation of Math. 221. Partial differential equations, Fourier series, cylindrical and spherical harmonics. Second semester.

Messrs. Cutler, Shook

Math. 324 (124). Theory of Errors and Least Squares, Empirical Formulas (3)

Probability; least squares and its application in the study of errors; formation of empirical formulas; numerical methods. Designed for students engaged in experimental or observational work. Prerequisite: *Math. 14*. First and second semesters. Mr. Latshaw

Math. 340 (140). Higher Algebra (3)

Theory of matrices and linear transformations; linear spaces; bilinear and quadratic forms. Prerequisite: *Math. 51*. First semester. Mr. Stoll

Math. 341 (141). Higher Algebra (3)

Some basic concepts of higher algebra: groups, rings, fields, lattices; algebra of classes; Boolean algebra. Second semester. Mr. Stoll

For Graduates

Math. 401 (201). Elementary Theory of Functions of Real Variables (3)

Classes, functions and relations; postulational development of positive integers; construction of real number system; elementary inequalities; convergence of infinite series and infinite products; real functions of real variables; derivatives; Riemann integral; existence theorems. First semester. Mr. Pitcher

Math. 405. Partial Differential Equations (3)

Classification and transformation of equations; theory of characteristics; initial and boundary value problems; Cauchy's problem for hyperbolic equations; Dirichlet's problem for elliptic equations; potential theory; Green's function; harmonic and sub-harmonic functions; difference equations; applications to equations of physics. Prerequisite: *Math. 322* or consent of the instructor. First semester. Messrs. Goldberg, Schecter, Shook

Math. 406. Partial Differential Equations (3)

Continuation of *Math. 405*. Second semester. Messrs. Goldberg, Schecter, Shook

Math. 409 (209). Mathematics Seminar (3)

An intensive study of some field of mathematics such as differential equations; integral equations; mathematical logic; advanced topics in complex variable theory; etc. Prerequisite: graduate standing and consent of the instructor. First semester. Staff

Math. 410 (210). Mathematics Seminar (3)

Continuation of *Math. 409*. Second semester. Staff

Math. 416 (216). Theory of Functions of a Complex Variable (3)

More detailed and more rigorous treatment of the theory of analytic functions than in Math. 315, and, in addition, the study of a number of more advanced topics. Prerequisite: *Math. 315 or its equivalent*. Second semester. Mr. Smail

Math. 417 (217). Theory of Elasticity (3)

Theory of stress and strain; tension and thrust with applications; bending of rods and plates; equilibrium of curved rods, cylinders, and spheres. First semester. Mr. Raynor

Math. 418 (218). Theory of Elasticity (3)

Continuation of Math. 417. Second semester. Mr. Raynor

Math. 423 (223). Differential Geometry (3)

The differential geometry of curves and surfaces. Prerequisite: Math. 206. First semester. Mr. Cutler

Math. 424 (224). Differential Geometry (3)

Continuation of Math. 423. The differential geometry of surfaces and Riemann spaces; tensor analysis. Second semester. Mr. Cutler

Math. 429 (229). Advanced Analytic Mechanics (3)

Conservative and non-conservative fields; generalized co-ordinates; Lagrange's equations; Hamilton's canonical equations; holonomic and non-holonomic systems; gyroscopic motion, etc. Prerequisite: Mech. 302 or consent of the instructor. First semester. Messrs. Lamson, Raynor

Math. 430 (230). Advanced Analytic Mechanics (3)

Continuation of Math. 429. Second semester. Messrs. Lamson, Raynor

Math. 431 (231). Calculus of Variations (3)

Fundamental existence theorems of analysis: the classical theory of necessary and of sufficient conditions for relative minima of single integrals; fields of extremals and the Hamilton-Jacobi theory; numerous physical and mechanical applications and extensions, to be chosen according to the special interests of the students. Second semester.

Messrs. Lamson, Pitcher

Math. 435 (235). Abstract Spaces (3)

Postulates; idea of abstraction; metric space; vector spaces; Banach space, with applications to summability, problem of moments, infinite system of linear equations; Hilbert space; topological spaces, manifolds, Riemann surfaces. Prerequisite: *Math. 401*. First semester. Mr. Wilansky

Math. 436 (236). Abstract Spaces (3)

Continuation of Math. 435. Second semester.

Mr. Wilansky

Math. 441 (241). Theory of Functions of Real Variables (3)

Lebesgue measure and the Lebesgue integral; functions of bounded variation; absolute continuity; differentiation and integration as inverse processes; multiple and iterated integrals; Fourier series; convergence in the mean; Riesz-Fischer theorem. Second semester.

Mr. Pitcher

Math. 442 (242). Introduction to Topology (3)

Elements of point-set topology, with emphasis on applications to Euclidean spaces and spaces of functions; combinatorial topology, with applications on connectivity. Second semester.

Messrs. Blakers, Pitcher

Math. 450 (250). Modern Algebra (3)

The development of a topic from the field of modern algebra, e.g. linear algebra, rings with minimal conditions, Galois theory of equations, valuation theory, lattice theory. Second semester.

Mr. Stoll

Math. 453 (253). Modern Methods in the Theory of Functions of a Complex Variable (3)

Analytic continuation; principle of maximum modulus; conformal representation; Taylor series analysis; integral functions; Dirichlet series. Prerequisite: *Math. 416*. First semester.

Mr. Smail

ASTRONOMY

Astr. 1. Descriptive Astronomy (3)

The earth as an astronomical body; the solar system; a brief introduction to sidereal astronomy. First and second semesters.

Astr. 2. General Astronomy (3)

The solar system; the sidereal system, with an introduction to celestial mechanics and astrophysics. Prerequisite: *Math. 13 previously or concurrently*. First or second semester.

Astr. 103 (3). Practical Astronomy (3)

Instruments used; methods of taking and reducing observations to determine time, latitude, and azimuth; observatory work in which each student makes his own observations and computations in illustration of the theory studied. Prerequisites: *Astr. 2*; *Math. 14*. Second semester.

Astr. 104 (4). Stellar Astronomy and Astrophysics (3)

Introduction to astrophysics; the sun considered as a star; physical characteristics of the stars; stellar motions; binary stars; theory of binary star orbits; stellar aggregations; cosmogony. Prerequisites: *Math. 13, and Physics 16 or Physics 23*. First or second semester.

A reference list of new and old numbers will be found at the back of the catalog.

MECHANICAL ENGINEERING

Professors Stuart and Klein

Associate Professors Jackson, J. B. Hartman, and Eppes

Assistant Professors Kelly and Sweeney

Messrs. Dominic, Benner, Eichelberger, Gebhart, Nedley, and Fedor

M.E. 1 (3). Machine Shop Practice (3)

This course is given for three weeks at the local technical high school during the summer session following the freshman year. Work on the various machine tools, use of hand tools, and the various methods of welding. Summer session.

M.E. 2 (39). Elementary Machine Design (3)

A study of the kinematic principles in mechanisms and their application in machines. Prerequisites: *C.E. 61, Math. 12, Phys. 22*. First and second semesters.

M.E. 102 (40). Machine Design (3)

Application of the principles of statics, dynamics, strength of materials, and kinematics to the design of machine elements. Prerequisite: *Mech. 111, M.E. 1*. First and second semesters.

M.E. 103 (121). Advanced Machine Design (3)

Vibration and balancing of machines; detailed design based on consideration of dynamic loading and fatigue. Prerequisite: *M.E. 102*. First semester.

M.E. 104 (22). Thermodynamics (3)

Energy; steady flow and nonflow equations and applications; reversible cycles; Carnot principle; fundamental temperature scale; entropy; properties of liquids, vapors, gases, and mixtures. Prerequisites: *Math. 13, Phys. 23*. First semester.

M.E. 105 (23). Thermodynamics (3)

Flow of elastic fluids through nozzles and orifices; cycles; the steam power plant; internal combustion engines; compressors; refrigeration. Prerequisite: *M.E. 104*. Second semester.

M.E. 106 (10). Instruments Laboratory (1)

An introduction to mechanical engineering laboratory, covering a study of instruments, their construction, use, errors and calibration. Prerequisite: *Phys. 23*. First semester.

M.E. 107 (11). Mechanical Engineering Laboratory (1)

Performance testing of power equipment and study of operational principles. Prerequisite: *M.E. 106* and *M.E. 104*. Second semester.

M.E. 108 (14). Mechanical Engineering Laboratory (2)

Experimental projects on power equipment, including engines, turbines, pumps, compressors, and refrigeration equipment, supplemented by lectures on laboratory methods and topics of general interest in mechanical engineering. Prerequisite: *M.E. 107* and *M.E. 105*. First semester.

M.E. 109 (18). Mechanical Engineering Laboratory (2)

Continuation of *M.E. 108*. Second semester.

M.E. 110 (15). Thesis (3)

Candidates for the degree of B.S. in M.E. may, with the approval of the director of the curriculum, undertake a thesis as a portion of the work during the senior year.

M.E. 160 (29). Heat Power (3)

Fuels; combustion; principles of engineering thermodynamics; properties of steam; steam power plant equipment and cycles; internal combustion engines. Prerequisites: *Math. 13*, *Phys. 23*. First and second semesters.

M.E. 161 (19). Mechanical Engineering Laboratory (1)

Testing of mechanical engineering equipment. Prerequisite: *M.E. 160*. First and second semesters.

M.E. 162 (21). Mechanical Engineering Laboratory (1)

Instruments, fluid flow, heat transfer. Prerequisite: *M.E. 104*. First semester.

M.E. 163 (25). Mechanical Engineering Laboratory (1)

Tests on steam engines, turbines, compressors, refrigeration equipment, internal combustion engines. Prerequisite: *M.E. 162*. Second semester.

M.E. 166 Procedures for Mechanical Design (3)

Studies of the functions of basic machine elements and their combinations. Types of loading imposed by service conditions. Static and dynamic loads. Stress analysis applied to the design of typical machine elements. Prerequisite: *Mech. 111*. First semester.

For Advanced Undergraduates and Graduates

M.E. 320 (124). Applied Thermodynamics (3)

Selected applications of thermodynamics to problems encountered in engineering practice. Prerequisite: *M.E. 105*. Mr. Stuart

M.E. 321 Heat Transfer (3)

Conduction, free and forced convection, radiation, evaporation and condensation, mass transfer. Application to design of heat exchangers in power plants, air conditioning and refrigeration apparatus. Prerequisite: *Math. 206; Mech. 121; M.E. 105*. Mr. Jackson

M.E. 322 (116). Mechanics of Compressible Fluids (3)

Study of the behavior of compressible fluids; laminar and turbulent flow with boundary layer considerations; thermodynamic and dynamic analysis of flow of fluids. Prerequisites: *Mech. 121, M.E. 105*. Mr. Jackson

M.E. 330 (117). Air Conditioning (3)

Development of the theories of air conditioning, heating and ventilating, with study of typical systems. Prerequisite: *M.E. 105*. First semester.

Mr. Gebhart

M.E. 331 (125). Air Conditioning and Refrigeration (3)

Advanced work in the field of air conditioning and refrigeration: study of automatic temperature and humidity control; design of typical systems, with emphasis on use of the *ASRE Guide*. Prerequisite: *M.E. 330*. Second semester.

Mr. Gebhart

M.E. 333 (123). Power Plants (3)

Study of the relation of the various pieces of power plant equipment to each other; calculations for the design of power plant elements; comparison of different types of plants driven by both steam and internal combustion engines; utilization of exhaust heat. Prerequisite: *M.E. 321*. Second semester.

Messrs. Stuart, Sweeney

M.E. 334 (144). Internal Combustion Engines (3)

Thermodynamics of internal combustion engine cycles; theory of spark ignition engines, Diesel engines, gas turbines and jet-propulsion; carburetion, fuel injection, supercharging. Prerequisite: *M.E. 105*.

Messrs. Jackson, Epps

M.E. 340 (122). Advanced Machine Design (3)

Project work on the design of a complete machine and study of adaptability of design to manufacturing considerations. Includes an introduction to the dynamics of engines, torque analysis, balancing, and flywheel design. Detailed design of selected engine components. Prerequisite: *M.E. 102*. Second semester. Messrs. Hartman, Eichelberger

M.E. 341 (127). Stress Analysis for Design (3)

Analytical and experimental methods of stress analysis applied to complex machine elements; experimental determination of proper distribution of material in highly stressed parts. Prerequisites: *M.E. 102, Math. 206*. First semester. Messrs. Hartman, Eichelberger

M.E. 342 (129). Elementary Mechanical Vibration Analysis (3)

Analysis of physical systems and setting up equations; development of significant engineering relationships. Emphasis on engineering application. Prerequisite: *Math. 206*. Second semester. Mr. Hartman

For Graduates

Subject to proper approval, a graduate major in mechanical engineering may include courses chosen from the following group: Math. 417 and 418, Theory of Elasticity; Math. 429 and 430, Advanced Analytic Mechanics; C.E. 400, Research Methods; C.E. 406, Structural Metals; Mech. 402, Advanced Analytical Mechanics.

M.E. 403 (211). Advanced Mechanical Engineering Laboratory (3)

The planning, design, execution and reporting of experimental tests and investigations in mechanical engineering. First semester. Mr. Jackson

M.E. 404 (212). Advanced Mechanical Engineering Laboratory (3)

Continuation of M.E. 403. Second semester. Mr. Jackson

M.E. 420 (200). Advanced Thermodynamics (3)

Critical review of first and second laws, entropy, and general thermodynamic equations and relations; applications to current problems in technology and research, including properties of fluids, combustion, stable and metastable states, availability, and flow processes. First semester.

Mr. Stuart

M.E. 421 (201). Advanced Thermodynamics (3)

Continuation of M.E. 420. Second semester. Mr. Stuart

M.E. 422 (216). Advanced Compressible Flow (3)

Flow of compressible fluids, including study of completely immersed bodies such as airfoils and turbine and compressor blades; internal flow with emphasis on Fanno and Rayleigh processes. Mr. Jackson

M.E. 431. Compressors and Pumps (3)

Study of centrifugal, axial flow, reciprocating and rotary compressors and pumps. Theory, design and application. Mr. Eppes

M.E. 432 (208). Steam Turbines (3)

Theory of the steam turbine; discussion of types: design and calculation of parts; application to stationary and marine service. Mr. Stuart

M.E. 433. Steam Power Plants (3)

Design and analysis of steam power cycles. Application of regenerative and reheat principles. Feed water heating and extraction calculations. Boiler, superheater, economizer and air heater performances. Principles of heat transfer as applied to the various elements of power plant equipment. Economics of plant location, fuel selection, operating conditions. First semester. Messrs. Sweeney and Stuart

M.E. 434 (203). Internal Combustion Engines (3)

History; laws of mixing, carburetion, atomization, combustion, and chemical equilibrium; heat losses; friction losses; governing; gas engine cycles; engine types. First semester. Messrs. Jackson, Eppes

M.E. 435 (204). Internal Combustion Engines (3)

Continuation of M.E. 434. Second semester. Messrs. Jackson, Eppes

M.E. 436 (207). Gas Turbines and Jet Engines

Theory of the gas turbine; discussion of types and cycles; application to stationary, marine, and aircraft installation; jet-propulsion. Second semester. Messrs. Stuart, Eppes

M.E. 440. Dynamics of Machinery (3)

Analysis of dynamic loads and the resulting stresses in machinery. Balancing of rotors. Force analysis of internal combustion engines. Dynamics of control mechanisms. First semester. Mr. Hartman

M.E. 441. Experimental Stress Analysis (3)

The application of certain experimental methods to problems of mechanical design involving static, dynamic and residual stresses. Laboratory use of brittle lacquers, strain gages, photoelasticity and analogies. First semester. Mr. Hartman

M.E. 442 (220). Advanced Mechanical Vibration Analysis (3)

Systems of more than one degree of freedom, stability, self-induced vibrations, harmonic analysis, alternative theoretical methods, vibration of elastic solids. Second semester.

Mr. Hartman

*A reference list of new and old numbers will be found at the back
of the catalog.*

METALLURGICAL ENGINEERING

Professors Doan, Butts, and Stout

Associate Professor Libsch

Messrs. J. H. Gross, Laxar, and Rowady

Met. 1. Introduction to Metallurgy (3)

Preliminary study of materials, apparatus, and types of processes used in the metallurgical industry; fuels and combustion; roasting, smelting, refining; ores, slags; furnaces, refractories, metal working and testing; pyrometry; welding. Lectures, laboratory exercises, plant visits. Prerequisites: *Chem. 4, or Chem. 15 and 16; Chem. 5; Phys. 22, or Phys. 12 and 16.* Second semester.

Met. 2. Metallurgy of Iron and Steel (2)

Same as Met. 102, but without plant visits or laboratory exercises. Prerequisite: Met. 1, 61, or 63. Second semester.

Met. 3. Metallurgy of Copper, Lead, and Associated Metals (2)

Same as Met. 103, but without plant visits or laboratory work. Prerequisite: Met. 1, 61, or 63. First semester.

Met. 61 (21). Engineering Metallurgy (2)

An abridgment of Met. 1, 102, 103, especially adapted to the viewpoint of users of metals. Prerequisites: *Chem. 4, 5; Phys. 22.* First and second semesters.

Met. 63 (23). Engineering Materials and Processes (3)

A study of engineering properties and materials. Methods and effect of fabrication and treatment. Application and use of materials in engineering. Primarily metals, but including plastics, ceramics, and other engineering materials. Prerequisites: *Chem. 4 and 5, Physics 22.* First and second semester.

Dr. Libsch

Met. 65 (33). Metallurgical Laboratory (1)

Physical metallurgical phenomena associated with the structure and properties of metals and alloys. Metallurgical tools—microscopy, hardness testing, temperature measurement; equilibrium diagrams as related to properties of commercial alloys such as bearing metals; cold deformation and annealing; age hardening; heat treatment of ferrous materials. Prerequisites: *Met. 1, 61, or 63, previously or concurrently*; Phys. 23, 24. First semester.

Met. 66 (34). Metallurgical Laboratory (1)

The structure and properties of steel. Hardenability and relation of chemical composition to structure. The relation of structure to tensile strength, yield strength, ductility, toughness, notch sensitivity, fatigue resistance and other design properties; special metallurgical techniques—welding, induction hardening, etc. Continuation of Met. 65. Prerequisites: *Met. 1, 61, or 63, previously or concurrently*; Met. 65; Phys. 23, 24. Second semester.

Met. 68 (81). Short Course in Metallurgical Engineering Problems (1)

An abridgment of the problem work of Met. 1 and 112. Prerequisites: *Chem. 4, Met. 61 or 63 previously or concurrently*; Chem. 5. First and second semesters.

Met. 100 (49). Summer Work

At the end of the junior year students in the curriculum of metallurgical engineering are required to secure in industrial plants at least eight weeks practical experience.

Met. 102 (52). Metallurgy of Iron and Steel (3)

Chemical and physical properties of iron and steel; manufacturing processes. Lectures and daily questions, plant visits, and laboratory exercises. Prerequisites: Met. 1 or 61. Second semester.

Met. 103 (53). Non-ferrous Metallurgy (3)

Production processes and properties of copper and its alloys, lead and its alloys, platinum, selenium and tellurium, bismuth, nickel, titanium, tin. Lectures, written exercises on text book assignments, and laboratory work, with formal written reports thereon. Two- or three-day inspection trip (expense about \$20.00) is required. Prerequisite: *Met. 1, 61, or 63*. First semester.

Met. 104 (54). Non-ferrous Metallurgy (2)

Production processes and properties of aluminum and its alloys, zinc, magnesium, gold, silver, mercury, antimony, etc. A one-day inspection trip (expense about \$3.00) is required. Prerequisite: *Met. 1, 61, or 63*. Second semester.

Met. 105 (125). Electrochemistry and Electrometallurgy (2)

Lectures and recitations concerning current and voltage in electrolysis, energy relations, electrode reactions, primary cells and storage batteries, electric furnaces, and practical applications of electricity to metallurgical processes. Prerequisites: *Chem. 5, Met. 1, 61, or 63; Phys. 24*. First semester.

Met. 112. (62). Problems in Iron and Steel Metallurgy (1)

A course of problems, involving the fundamental principles of the various processes in the metallurgy of iron and steel, to give the student an understanding of the quantitative relationships in the processes. Prerequisites: *Met. 102 or 61, 63, previously or concurrently*. Second semester.

Met. 135. Electrochemical Laboratory (1)

Quantitative relations in the deposition of metals by electrolysis; experimental study of the conditions controlling the nature of electrolytic deposits, electrolysis of fused salts, cathodic and anodic reactions. Prerequisites: *Chem. 5; Met. 1, 61, or 63; Phys. 24; Met. 105, previously or concurrently*. First semester.

Met. 191 (91). Thesis in Metallurgy (3)

Candidates for the bachelor's degree in metallurgical engineering may, with the approval of the head of the department, undertake a thesis as a portion of the work during the senior year. First or second semester.

For Advanced Undergraduates and Graduates

Met. 230 (130). Physical Metallurgy (3)

The states of matter; physical structure and constitution of metals; properties as related to atomic structure; X-rays and crystal structure; effect of mechanical working, heat treatment and composition; casting, shaping, welding, and testing metal objects. Lectures, plant visits and laboratory work. Prerequisites: *Chem. 5, Phys. 22; Met. 1, 61, or 63*. First semester.

Mr. Doan

Met. 231 (131). Metallography (3)

Internal structures of alloys and the constitutional diagram; the relation between structure and properties in industrial alloys; quenching and aging. Lectures, problems, and laboratory experiments. Prerequisites: *Chem. 5, Phys. 22; Met. 1, 61, or 63, and 230*. Second semester.

Mr. Doan

Met. 308 (108). Electrometallurgy (3)

The practical application of electricity to metallurgical processes; electroplating and electric furnace plants and practice. Lectures and laboratory work. Prerequisites: *Met. 1, 61, or 63; Met. 105.* Second semester.

Mr. Butts

Met. 338 (138). Metallurgical Colloquium (2)

An opportunity for the student to develop (1) an acquaintance with the current metallurgical literature, (2) the ability to interpret it clearly, and (3) skill in presenting oral engineering reports. Prerequisites: *Met. 1, 61, or 63; Met. 102 and 230.* Second semester.

Mr. Doan

Met. 352 (152). Advanced Metallurgy of Iron and Steel (3)

Continuation of *Met. 102* for seniors and graduate students. Lectures, plant visits, laboratory exercises, written reports. Prerequisite: *Met. 102.* Second semester.

Mr. Stout

Met. 358. Industrial Metallurgy (2)

An opportunity for the advanced student to integrate basic metallurgical engineering course material and to apply what he has learned in the solution of problems relating to (1) design and service requirements of metal components, (2) failure of metal components, and (3) selection of materials and processes. Discussion of specific problems to develop approach to and judgment of engineering problems involving metallurgy. Lecture, problems, and laboratory. Prerequisites: *Met. 230, 231, Met. 102, Met. 103,* and previously or concurrently, *Met. 104, Met. 352.* Second semester.

Mr. Libsch

Met. 363 (163). Non-ferrous Metallurgical Problems (1)

A course of problems concerned with the principles utilized in the metallurgy of copper, lead, silver, and gold. Prerequisites: *Met. 1 or 68; Met. 103 previously or concurrently; Met. 112.* First semester.

Mr. Butts

Met. 364 (164). Non-ferrous Metallurgical Problems (1)

A course of problems concerned with the principles utilized in the metallurgy of zinc, aluminum, etc. Prerequisites: *Met. 1 or 68; Met. 104 previously or concurrently, Met. 112 and 363.* Second semester.

Mr. Butts

Met. 375 (175). Elective Projects in Metallurgy (2)

An opportunity for the advanced student to undertake an independent investigation in a metallurgical field of his own choice. Assistance will be given only when the student requests it. The project may be either a comprehensive literature investigation, a theoretical study, or one involving laboratory experiment. The project must receive approval of the department before work is begun. First and second semesters.

Messrs. Butts, Doan, Libsch, Stout

P.D. 101. Professional Development (1)

Conference hours with the Department staff and guests for the purpose of developing the professional outlook of the engineering student. Required reading and term papers. Prerequisite: Senior standing. First semester.

P.D. 102. Professional Development (1)

Continuation of P.D. 101. Second semester.

For Graduates

NOTE. Not all of the courses listed below will be given in any one year. Those to be given will be determined by the number of applicants at the beginning of the semester; if the number is less than six, the course may be omitted.

Chem. 436 and 437, X-ray Research; Phys. 363, The Physics of Solids, and C.E. 406, Structural Metals, may be included in a graduate major in metallurgy.

School of Metallurgical Engineering Practice

Lehigh University, in cooperation with the Bethlehem Steel Company, offers this graduate curriculum. It leads to the degree of Master of Science in Metallurgical Engineering Practice.

In addition to facilities at the University, a field station is maintained in the local plant of the Bethlehem Steel Company.

Work performed at the field station consists essentially of original investigations of a development and plant test nature.

The curriculum consists of six weeks preparatory work during the regularly scheduled summer session at the University, followed by twenty-four weeks practice in applying research processes to plant methods in the field station at the Bethlehem Steel Company. Requirements for the degree are completed by fifteen hours of further graduate study at the University.

Admission to the curriculum is limited to ten students.

Met. 401 (201). Metallurgical Investigation and Thesis (4-6)

Investigation of some special metallurgical problems, such as an improvement or innovation in some metallurgical process, the establishment

of an equilibrium diagram, the effect of heat treatment on a metal or alloy; study of the literature. The study and investigation must be embodied in a written report. Prerequisite: undergraduate metallurgical courses in the field of the investigation. First and second semesters.

Messrs. Butts, Doan, Libsch, Stout

Met. 402 (202). Metallurgical Investigation and Thesis (3)

Continuation of Met. 401. First and second semesters.

Messrs. Butts, Doan, Libsch, Stout

Met. 403 (203). Advanced Electrometallurgy (3)

Specialized study in some particular field of electrochemistry or electrometallurgy selected by the student, such as electrode reactions, thermodynamics of electrolysis, electroplating, electrolytic refining, electrothermics, electrothermal efficiencies, industrial processes. Prerequisite: Met. 105. First or second semester.

Mr. Butts

Met. 405 (205). Non-ferrous Metallurgy (3)

Detailed study of the metallurgy of any one or more of the non-ferrous metals, including historical evolution, reading of references on modern practices, and theoretical consideration of the possibilities of future development in manufacture or use. Both chemical and physical metallurgy of the alloys may be included. Prerequisite: a course in non-ferrous metallurgy. First or second semester.

Mr. Butts

Met. 408 (208). Advanced Physical Metallurgy (3)

Advanced studies in the several areas of this field. Modern theories. Prerequisites: Met. 231; facility in reading German. Second semester.

Mr. Doan

Met. 410 (210). The Physical Chemistry of the Metals (3)

The principal fields of physical chemistry in their relation to the extraction of metals from their ores; the refining, alloying, heat treatment, welding, and corrosion of metal systems. Prerequisites: one undergraduate course in physical chemistry; elementary ferrous or non-ferrous metallurgy or Met. 230 and 231. First or second semester.

Mr. Stout

Met. 411 (211). The Principles of Modern Welding (3)

The foundations in scientific principle upon which the welding processes rest; the present limitations of the various processes; the trends in new developments; the engineering, industrial, and commercial aspects of welding. Prerequisites: Met. 230 and 231. First or second semester.

Mr. Stout

Met. 412 (212). Radiography in Principle and Practice (3)

The principles of radiography; X-rays and gamma rays; industrial practices. Prerequisites: Phys. 255, Met. 230. First or second semester.

Mr. Doan

Met. 419 (219). Alloy Steels (3)

The effects of alloying elements on the metallography, heat treatment, and physical properties of steel. Engineering characteristics of constructional, tool, stainless, and other alloy steels. Prerequisites: ferrous metallurgy; and, previously or concurrently, Met. 130, 131, and 152. First or second semester. Mr. Stout

Met. 421 (221). Surface Treatment of Metals (3)

Study of metallic surfaces, primarily steel; preparation of surfaces by machining, grinding, polishing; methods of surface hardening; corrosion and surface protection of metals; analysis of surface stresses as related to fatigue life. Prerequisites: Met. 102, 103, 104, 230, 231 or equivalents. First semester. Mr. Libsch

Met. 423 (223). Powder Metallurgy (3)

A study of the powder metallurgy processes for forming metal parts. Discussion of metal powder production and characteristics, plastic deformation and bonding associated with pressing, the mechanism of sintering, and the nature of the sintered product; preparation of sintered alloy compacts; application of the process to special industries. Prerequisites: Met. 102, 103, 104, 230, 231, or equivalents. First or second semester. Mr. Libsch

Met. 425 (225). Metallurgical Field Station (15)

This course is restricted to those who are enrolled in the School of Metallurgical Engineering Practice. A period of approximately 24 weeks is spent in the plant of the Bethlehem Steel Company. Application of metallurgical research methods to full scale plant operations.

Messrs. Stout, Gross

A reference list of new and old numbers will be found at the back of the catalog.

MINING ENGINEERING

Professors Callen and Gallagher

MINING ENGINEERING

Min. 2 (6a). Mine Surveying (2)

Methods of underground surveying; note forms; determination of true meridian and latitude; methods of carrying meridian underground through tunnels, slopes, and shafts; problems on mineral land and mine surveying. Prerequisite: C.E. 40. Second semester.

Min. 4 (16). Mine Surveying, Field Work (2)

Practice in surface and underground surveying; calculation of field notes; preparation of mine maps. Eight hours of field and laboratory work at an operating mine each week day for two weeks. Prerequisite: *Min. 2, which it must follow immediately*. Summer session.

Min. 100 (20). Industrial Employment

Industrial employment in mining or a related field for eight weeks, usually in the summer following the junior year. A written report is required. Prerequisite: *junior standing*.

Min. 101 (21). Mining Fundamentals (3)

Methods of prospecting; drilling, explosives, and blasting; tunneling, slope and shaft-sinking; support of workings; machines for cutting and loading. Prerequisites: *Math. 13, Phys. 24, Geology 1, previously or concurrently*; *Mech. 111 concurrently*. First semester.

Min. 161 (15). Mining Engineering (3)

A survey of the elements of mining engineering for students in curricula other than mining engineering. Prospecting, drilling, excavation, support, mining methods, mineral preparation. Prerequisite: *Geology 1 or 6, junior standing*. First semester.

For Advanced Undergraduates and Graduates

Min. 202 (22). Methods of Mining (3)

The methods of working bedded and vein deposits, with special attention to principles involved in the selection of a mining method and to mechanization. Prerequisite: *Min. 101*. Second semester. Mr. Gallagher

Min. 203 (103). Mine Ventilation (3)

A study of mine atmospheres and of gases produced or encountered in mining operations; distribution and control of the ventilating current to meet requirements of safe and efficient operation; mine fires and explosions. Prerequisites: *Min. 202 and Mech. 121*. First semester.

Mr. Callen

Min. 204 (104). Haulage, Hoisting, and Pumping (3)

The fundamentals of basic design, selection, and application of equipment for transportation of mineral products from working face to surface plant; sources, control, and disposal of mine water. Prerequisites: *Min. 202, Mech. 111, E.E. 160 and M.E. 160*. Second semester. Mr. Callen

Min. 205 (106). Mining Economics (3)

Systematic exploration and examination; theory and methods of sampling; reserves; mine taxation; depreciation and depletion; valuation and reports. Prerequisites: *Min.* 202; *Acctg.* 104. First semester. Mr. Callen

Min. 206 (105). Mine Administration (2)

Mining law; mine organization and management; wage systems and trade agreements; mine safety organization and regulation; special aspects of workmen's compensation laws; personnel administration. Prerequisite: *Min.* 202. Second semester. Mr. Callen

Min. 207 (107). Mineral Preparation (3)

Recovery of minerals from ores; machines and apparatus used for coarse and fine crushing; classifying and preparation for concentration; methods of concentration, including gravity and magnetic methods, flotation, etc.; principles of concentration applied to the preparation of coal. Visits to mills and coal washing plants. Prerequisites: *Geol.* 31 or 35, *Phys.* 23, 24; *Chem.* 38, *Min.* 202. First semester. Mr. Gallagher

Min. 252 (10 and 12). Fuel Technology (3)

Solid fuels: sampling; proximate and ultimate composition of coals, calorific values, fusibility of ash; classification of coal; carbonization and gasification of fuel. Coal and gas analysis, calorimetry. Prerequisite: *Chem.* 38 or equivalent. Second semester. Mr. Callen

Min. 254 (108). Advanced Mineral Preparation (3)

An extension of the study of fundamental theories of mineral preparation begun in *Min.* 207, with special reference to flotation of metallic and non-metallic minerals; design of flow sheets based on results of laboratory tests. Prerequisite: *Min.* 207. Second semester. Mr. Gallagher

For Graduates

Students desiring to do graduate work in mining engineering should consult with the head of the department with regard to their qualifications.

Min. 411 (211). Mining Research (2-6)

Investigation of a problem in one of the fields of mining engineering: (a) Mining Methods; (b) Mineral Preparation; (c) Mine Ventilation; (d) Mining Economics. First or second semester. Messrs. Callen, Gallagher

Min. 412 (212). Mining Research (2-6)

A continuation of *Min.* 411. First or second semester.

Messrs. Callen, Gallagher

Min. 413 (213). Advanced Mining Practice (3-9)

A continuation and amplification of undergraduate work in the major fields of mining engineering. A student may register for one, two, or three of the fields in any one semester: (a) Mining Methods; (b) Mineral Preparation; (c) Mine Ventilation; (d) Mining Economics. First or second semester.
Messrs. Callen, Gallagher

Min. 414 (214). Advanced Mining Practice (3-9)

A continuation of Min. 413. First or second semester.
Messrs. Callen, Gallagher

ENGINEERING GEOPHYSICS

For Advanced Undergraduates and Graduates

Eng. Geop. 201 (101). Geophysical Methods (3)

A treatment of the fundamental principles underlying all geophysical methods; elements of theory and physical principles of instruments; physical properties of rocks and formations and methods of their determination. Prerequisites: *Math. 13, Phys. 24, or 16 and 17; Geol. 1 previously or concurrently*. First semester.
Mr. Gallagher

Eng. Geop. 202 (102). Geophysical Applications (3)

A detailed study of the applications of geophysical prospecting to the fields of mining, geology, and engineering. Prerequisite: *Eng. Geop. 201*. Second semester.
Mr. Gallagher

Eng. Geop. 301 (103). Seismic and Magnetic Prospecting (3)

Seismic: elements of the theory of elastic deformations and wave propagation; a detailed study of the methods (fan shooting, refraction, and reflection); theory and description of seismographs. Magnetic: magnetic properties of rocks and minerals; theory and description of magnetic instruments; corrections, representations, and results. Prerequisites: *Eng. Geop. 202, Math. 206, Phys. 212*. First semester.
Mr. Gallagher

Eng. Geop. 302 (104). Electrical and Gravitational Prospecting (3)

Electrical: the fundamental principles of the electrical prospecting methods—self potential, AC and DC equipotential, resistivity, potential-drop-ratio, electromagnetic and radio; the electrical properties of rocks and minerals; theory and description of equipment and interpretation of results. Gravitational: a treatment of the gravitational principles and methods; pendulum, gravimeter, and torsion balance; the theory and description of gravitational instruments; corrections, interpretation, and results. Prerequisites: *Eng. Geop. 202, Math. 206, Phys. 212*. Second semester.
Mr. Gallagher

*A reference list of new and old numbers will be found at the back
of the catalog.*

MUSIC

Associate Professor Schempf

Mr. Gansz

Band 1-8. Lehigh University Band (2)

Mus. 11. Introduction to Music (1)

A course designed for students with little or no experience in music, to stimulate intelligent listening and to develop the ability of recognizing the principal styles, forms, and materials. First semester.

Mus. 12. Introduction to Music (1)

Continuation of Mus. 11. Second semester.

Mus. 13. Introduction to Music Literature (3)

A study of the development of music from the Dark Ages to the early nineteenth century, with emphasis on the significant examples of several styles and composers. This course and its continuation, Mus. 14, are designed for students interested in learning the importance of music in Western civilization. Two one-hour periods each week will be devoted to lectures and one two-hour period to supervised listening to recordings and studying available music. The ability to read music will be an asset, but is not required for admission to these courses. First semester.

Mus. 14. Introduction to Music Literature (3)

Continuation of Mus. 13. A study of music in the nineteenth and twentieth centuries, including contemporary American music. Second semester.

Mus. 17. Basic Musicianship (3)

Review of the fundamentals of music, including keys, clefs, scales, intervals, rhythmic and melodic notation; sight singing, ear training, and composition of melodies with simple harmonization. Emphasis will be placed upon training the ear. Prerequisite: familiarity with bass and treble clefs. First semester.

Mus. 18. Basic Musicianship (3)

Continuation of Mus. 17. Development of ability to write and harmonize simple chorale melodies in the style of Johann Sebastian Bach and to write simple two- and three-part forms. Prerequisite: Mus. 17 or consent of the instructor. Second semester.

Mus. 20. Instrumentation (2)

Study of the instruments of the band and orchestra; practical work in arranging various instrumental combinations. Prerequisite: consent of the instructor. First or second semester.

THE LEHIGH UNIVERSITY BAND

Band may be elected by suitably qualified freshmen and sophomores in place of, or in addition to, military science and tactics. It may be carried as an optional subject by suitably qualified juniors and seniors.

The Band will consist of a marching and concert band and will provide music, as specified by the director, for convocations, athletic events, campus and radio programs and military ceremonies; during the latter to be considered an integral part of the R.O.T.C. regiment.

Except during the fall season rehearsals will be twice weekly but, in addition, provisions will be made for sectional rehearsals and individual instruction to be required of all members.

Coat, cap, trousers, and belt of uniform, musical instruments and music are furnished by the University. A deposit of \$25.00 is required from each member of the band for an instrument or uniform.

Students serving in the band receive the following awards: a charm for one year of satisfactory service; for two years of service, a sweater; three years, \$20.00 in cash; and four years, an additional \$20.00 in cash.

A reference list of new and old numbers will be found at the back of the catalog.

PHILOSOPHY

Associate Professor Ziegler

Messrs. Grünbaum and Root

Phil. 3. Introduction to Philosophy (3)

What philosophy is, the nature of its problems, its relations to other fields of study. An elementary but systematic approach. Textbook, collateral readings, and discussions. First and second semesters.

Phil. 14. Logic and Scientific Method (3)

An introduction to traditional logic; inquiry into the nature of discovery and proof. First and second semesters.

Phil. 15. Ethics: The Theory of Conduct (3)

Ethics as a philosophical discipline; origin and development of moral practices and ideas; analysis of the nature of the good, duty, right, moral judgment, and moral ends; consideration of moral issues in contemporary life. First and second semesters.

Phil. 151. Esthetics (3)

An attempt to reach a consistent, inclusive account of the nature of the esthetic and its place in the life of man and in social organization. Prerequisite: *one course in philosophy*. First semester. Mr. Ziegler

Phil. 171 (71). Readings in Philosophy (2 or 3)

A course of readings in any of the various fields of philosophy: designed for the student who has a special interest in work not covered by the regularly rostered courses. Prerequisites: *senior standing and permission of the instructor*. First semester. Staff

Phil. 172 (72). Readings in Philosophy (2 or 3)

Continuation of Phil. 171. Second semester. Staff

Phil. 181 (81). The Organization of Knowledge (3)

A study of the methods, presuppositions, and interrelations of the various fields of knowledge, their present status in our culture, and their contribution to the development of intelligent points of view on contemporary problems. Prerequisite: *senior standing*. Second semester.

Mr. Ziegler

Phil. 191 (91). Proseminar in Metaphysics (2 or 3)

A study of one or more of the basic problems of philosophy through detailed reading and discussion of some classic in metaphysics. Prerequisite: *Phil. 132 and two additional advanced courses in philosophy*. First semester. (Not offered 1951-52.) Staff

Phil. 192 (92). Proseminar in Metaphysics (2 or 3)

Continuation of Phil. 191. Second semester. (Not offered 1952.) Staff

For Advanced Undergraduates and Graduates

Phil. 231 (131). Ancient and Medieval Philosophy (3)

From the beginnings of scientific and philosophical reflection in Ionia to the Renaissance. Textbook, selected dialogues of Plato, selections from Aristotle, and other collateral reading. First semester. Mr. Ziegler

PHILOSOPHY

Phil. 232 (132). Modern Philosophy (3)

Continuation of Phil. 231, covering the period to the death of Kant. Textbook, readings in the works of the philosophers studied. Phil. 231 is recommended, but not required, as a prerequisite. Second semester.

Mr. Root

Phil. 237 (137). Nineteenth Century Philosophy (3)

Continuation of Phil. 232. Prerequisite: *Phil. 232*. First semester.

Mr. Grünbaum

Phil. 238 (138). Twentieth Century Philosophy (3)

Continuation of Phil. 237. Prerequisite: *Phil. 237*. Second semester.

Mr. Root

Phil. 239 (139). American Philosophy (3)

A study of the chief American philosophers of the eighteenth and nineteenth centuries, and of philosophical problems and aspects of American life and history. The interests of students of American literature and history are especially considered. Prerequisite: *Phil. 232*. Second semester.

Mr. Ziegler

Phil. 261 (161). Philosophy of Science (3)

An analysis of the structure and significance of modern scientific knowledge. The meaning of explanation and proof, fact and theory, causality, space, time, and continuity. Attention will be focused primarily on the exact sciences. Prerequisite: sufficient background in philosophy or the sciences, as determined by the head of the department. First semester; possibly also second semester.

Mr. Grünbaum

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PHYSICS

Professors Myers, Bayley, and C. W. Curtis

Associate Professors Cheney, Sawyer, Hyatt, Emrich, and Havas

Assistant Professors Spatz and Wheeler

Messrs. Bludman, Clohessy, Hager, Laponsky, Shreve, Budenstein, Burkhard, Chesnut, Clifford, Costello, Crownfield, Fontheim, Fox, Grey, Irvine, J. E. Mack, McGinn, McLennan, Simpson, Wilcox and Yingst

Phys. 12. Introduction to Physics (3)

A survey course for students in the Colleges of Arts and Science and of Business Administration. A brief introduction to the principal fields of physics. Lecture demonstrations, recitations, and laboratory. First semester.

Phys. 16. General Physics (3)

A continuation of Phys. 12. Lecture demonstrations and recitations. Prerequisite: Math. 1 or 1b; Phys. 12. Second semester.

Phys. 17. General Physics Laboratory (2)

A laboratory course in general physics to accompany Phys. 16. Prerequisites: Math. 1 or 1b; Phys. 12. Second semester.

Phys. 22. Mechanics and Properties of Matter (4)

Introduction to mechanics of solids and fluids; dynamics of point masses and rigid bodies; properties of matter. Two recitations, one lecture, and one laboratory period per week. First and second semesters.

Phys. 23. Heat, Sound, and Light (4)

Wave-motion and sound; heat, with emphasis on the mechanical theory; optics, with emphasis on those portions of interest to technical students. Two recitations, one lecture, and one laboratory period per week. The calculus is employed in this course. Prerequisites: *Math. 13 previously or concurrently*; Phys. 22. First and second semesters.

Phys. 24. Electricity and Magnetism (4)

Ohm's law, electric and magnetic fields, electromagnetism, induced electromotive forces, etc. Two recitations, one lecture and one laboratory period per week. The calculus is employed in this course. Prerequisites: *Math. 13, previously or concurrently*; Phys. 22. First and second semesters.

Phys. 100 (50). Industrial Employment

Eight weeks industrial employment during the summer following the junior year, with submission of a written report.

Phys. 110. Electrical Laboratory (1)

Precise measurements. Prerequisite: *Phys. 24*. First semester. Mr. Bayley

Phys. 111. Electrical Laboratory (1)

Precise measurements. Continuation of Phys. 110. Prerequisites: *Phys. 24*; Phys. 110. Second semester. Mr. Bayley

Phys. 171 (168). Physics Proseminar (1)

Discussion of current problems in physics. Second semester.

Messrs. Cheney, Spatz

Phys. 191 (61). Laboratory Techniques (1)

Laboratory practices and glass blowing. Prerequisites: Phys. 17 or 23 and 24.

Phys. 192 (164). Advanced Physics Laboratory (1 or 2)

Laboratory work of research type. Special problems assigned and the student placed largely on his own initiative. Prerequisite: senior standing in physics. First semester. Messrs. Bayley, Emrich, Myers

Phys. 193 (165). Advanced Physics Laboratory (1 or 2)

Continuation of Phys. 192. Prerequisite: senior standing in physics. Second semester. Messrs. Bayley, Emrich, Myers

For Advanced Undergraduates and Graduates

Phys. 212 (162). Introductory Theory of Electricity and Magnetism (3)

Magnetic fields and potentials; electrostatic fields, potentials and capacities; electromagnetic fields; variable and alternating current. Prerequisites: *Math. 206 or 219 previously or concurrently, Phys. 16 or 24.* First semester.

Mr. Hyatt

Phys. 213 (163). Introductory Theory of Electricity and Magnetism (3)

A continuation of Phys. 212.

Mr. Hyatt

Phys. 252 (122). Geometrical and Physical Optics (4)

Geometrical optics and the wave theory of light, interference, diffraction, polarization, etc.; exposition of some phases of spectroscopic phenomena. One laboratory and three class periods a week. Prerequisites: *Math. 13; Phys. 23 and 24 or 16.* Second semester. Messrs. Cheney, Curtis

Phys. 268 (160). Introduction to Modern Physical Theories (3)

Recent developments, Maxwell's field equations, photoelectricity, radiation, the quantum theory, X-rays, relativity, atomic and nuclear structure, and cosmic rays. Prerequisites: *Math. 14; Phys. 16, or 23 and 24.* First semester. Mr. Sawyer

Phys. 269 (161). Introduction to Modern Physical Theories (3)

Continuation of Phys. 268. Prerequisites: *Math. 14; Phys. 16, or 23 and 24; Phys. 268.* Second semester. Mr. Sawyer

Phys. 314 (124). The Physics of Electronics (4)

Electron and ion ballistics, electrons in metals and electron emission, electrical discharge in gases, vacuum tube characteristics and an introduction to electronic circuits. One laboratory, and three class periods a week. Prerequisites: *Math. 14; Phys. 16, or 23 and 24; Phys. 111, 212.* First semester. Mr. Wheeler

Phys. 315 (120). Electric Oscillations and Electric Waves (4)

Electric oscillations and waves and high frequency phenomena. One laboratory and three class periods a week. Prerequisites: *Math. 14; Phys. 16, or 23 and 24; Phys. 111, 212.* Second semester. Mr. Wheeler

Phys. 340 (126). Heat, Thermodynamics, and Pyrometry (4)

Basic principles of heat, thermodynamics, and kinetic theory of gases with emphasis on physical systems, supplemented by practical exercises in the use of thermocouples, resistance thermometers, pyrometers, and similar instruments. One laboratory and three class periods a week. Prerequisites: *Math. 13, Phys. 16 or 23 and 24*. First semester. Mr. Emrich

Phys. 362 (170). Spectroscopy (2 or 3)

The interpretation of the findings of modern spectroscopy with particular emphasis on the theory and applications of atomic spectra. The method of obtaining data will be illustrated in laboratory problems. Two class periods per week and one optional laboratory period per week. Students desiring the laboratory work will register for three credits. Second semester. Prerequisites: *Math. 13; Phys. 16 or 23 and 24*. Mr. Curtis

Phys. 363 (132). Modern Theory of Solids (3)

Recent developments in the theory of solids with particular reference to the physics of metals. Prerequisites: *Math. 14; Phys. 16 or 23 and 24; Phys. 268*. Mr. Curtis

Phys. 372 (166). Special Topics in Physics (1-3)

A course covering selected topics not sufficiently covered in the general courses. Lectures and recitations or conferences. Prerequisites: *Math. 206, Phys. 23 and 24*. First and second semesters. Staff

For Graduates

The election of purely graduate courses in physics should ordinarily be preceded by such study of the particular field as that presented in courses in the "200" and "300" groups. A thorough knowledge of the differential and integral calculus is presupposed, and further accompanying study of mathematics is generally advisable.

E.E. 433, 434, 441, and 442, and Mech. 402 may be included in a graduate major in physics.

Phys. 420 (220). Theoretical Physics (3)

The fundamental principles of theoretical physics. The subject matter covered in this course and in Phys. 421, 422, and 423 is that generally considered necessary for more detailed work in special fields. Required of all candidates for the doctorate. First semester. Mr. Clohessy

Phys. 421 (221). Theoretical Physics (3)

Continuation of Phys. 420. Prerequisite: Phys. 420. Second semester.

Mr. Clohessy

Phys. 422 (222). Advanced Theoretical Physics (3)

A continuation of Phys. 420 and 421. Required of all candidates for the doctorate. Prerequisite: Phys. 421 or equivalent. First semester. Mr. Havas

Phys. 423 (223). Advanced Theoretical Physics (3)

Continuation of Phys. 422. Prerequisite: Phys. 422. Second semester.
Mr. Havas

Phys. 424 (214). Quantum Mechanics (3)

General principles of the present theory; applications to simple problems; perturbation methods; calculation of energy levels and spectral intensities; quantum theory of collision processes and of radiation; nuclear quantum mechanics. First or second semester. Mr. Bludman

Phys. 425 (215). Quantum Mechanics (3)

A continuation of Phys. 424. First or second semester. Mr. Havas

Phys. 428 (231). Methods of Mathematical Physics (3)

The equations of theoretical physics and the methods of their solution. Intended to accompany Phys. 420. First semester. Mr. Wheeler

Phys. 429 (232). Methods of Mathematical Physics (3)

Continuation of Phys. 428. Intended to accompany Phys. 421. Second semester. Mr. Wheeler

Phys. 440 (202). Thermodynamics (3)

A course devoted principally to classical thermodynamics. First semester.

Phys. 441 (201). Kinetic Theory (3)

The classical and quantum considerations of the kinetic theory of gases, and of statistical mechanics, with additional applications to electrical phenomena. Second semester.

Phys. 452 (207). Theory of Light (3)

The propagation of light; interference, diffraction; the measurement of wave-length; crystal optics; introduction to quantum theories of the interpretation of spectra. First or second semester. Mr. Cheney

Phys. 464 (241). Atomic and Molecular Physics (3)

Studies of the extra-nuclear properties of atoms and molecules and the foundations of quantum theory. Mr. Bludman

Phys. 465 (226). Nuclear Physics (3)

Studies of stable and unstable nuclei, fundamental nuclear particles, nuclear reactions, and methods of producing them. Second semester.

Mr. Spatz

Phys. 467 (227). Nuclear Physics (3)

Continuation of Phys. 465, dealing particularly with nuclear theory. Second semester.

Mr. Havas

Phys. 472 (167). Special Topics in Physics (1-3)

Selected topics not sufficiently covered in the more general courses. First or second semesters.

Staff

Phys. 474 (260). Seminar in Modern Physics (3)

A discussion of important advances in experimental physics. First or second semester.

Messrs. Emrich, Myers

Phys. 475 (261). Seminar in Modern Physics (3)

A discussion of important advances in theoretical physics. First or second semester.

Mr. Havas

Phys. 476 (216). Theory of X-rays (3)

The theory of the production and properties of X-rays; reflection, scattering, and dispersion of X-rays; crystal structure determination; X-ray spectra; ejection of electrons. First or second semester.

Mr. Bayley

Phys. 491 (291). Research (3)

Research problems in experimental or theoretical physics. May be repeated for credit. First semester.

Phys. 492 (292). Research (3)

Continuation of Phys. 491. May be repeated for credit. Second semester.

PSYCHOLOGY

Professors Ford and W. L. Jenkins

Associate Professor Graham

Assistant Professor N. B. Gross

Messrs. McGurk, Heisler and Levett

Psych. 1. Elementary Psychology (3)

The principles of human behavior and the methods of investigation. A foundation course for all students taking further work in psychology. Pre-

requisite: sophomore standing or secondary school background in physics and chemistry. First and second semesters.

Psych. 4. Elementary Social Psychology (3)

Study of representative modern problems, such as leadership, change, conflict, group differences and prejudices, motivating forces, and techniques of control, with a view to acquiring an understanding of social adjustments adequate for responsible citizenship. Second semester.

Psych. 16. Psychology in Business (3)

Psychological problems involved in advertising and selling; sales personnel; psychology from the standpoint of the consumer. Prerequisite: Psych. 1. Second semester.

Psych. 22. General Applied Psychology (3)

A survey of present day applications of psychology to problems in personal and vocational guidance, leadership, propaganda and public opinion, industry, business and advertising, law and the criminal code. Prerequisite: Psych. 1. Second semester.

Psych. 100 (51). Readings in Psychology (2 or 3)

Readings on organized topics selected after consultation with staff members. Prerequisite: Psych. 1 and consent of the instructor. First and second semesters.

Psych. 111. Minor Research (2 or 3)

Assigned problems for investigation. Prerequisites: Psych. 1 and consent of the head of the department. First and second semesters.

Messrs. Ford, Graham, Jenkins, Gross, McGurk

Psych. 112. Minor Research (2 or 3)

Either a continuation of Psych. 111 or a different problem for investigation. Prerequisites: Psych. 1 and consent of the head of the department. First and second semesters.

Messrs. Ford, Graham, Jenkins, Gross, McGurk

For Advanced Undergraduates and Graduates

Psych. 302 (102). Psychological Tests and Measurements (3)

The predictive measurements of individual differences, concepts, techniques, and materials necessary to understand selection and guidance problems. Prerequisites: Psych. 1 and a course in elementary statistics. First semester.

Mr. Jenkins

Psych. 304 (104). Social Psychology (3)

A psychological interpretation of social phenomena. Prerequisite: Psych. 1. First semester.

Mr. Graham

Psych. 308 (108). Child Psychology (3)

A study of the life stages and patterns of adjustment that are characteristic of age changes, and of the developmental methods and principles that underlie man's changing physical and mental response systems. Prerequisite: Psych. 1. Second semester. Mr. Graham

Psych 309 (109). Abnormal Psychology (3)

Gross maladjustment patterns and deviations in individual and societal behavior. Lectures, discussions, and clinical observations in the psychopathic hospital. Prerequisite: Psych. 1. Second semester. Mr. Graham

Psych. 313 (113). Practice in Applied Psychology (3)

Individual problems and programs involving field applications of psychology will be assigned. The objective will be the development of skills and competence in using psychological materials. Prerequisites: six hours of psychology and consent of the head of the department. First semesters. Messrs. Ford, Jenkins, Graham, McGurk

Psych. 314 (114). Practice in Applied Psychology (3)

A continuation of Psych. 313. Prerequisites: six hours of psychology and consent of the head of the department. Second semester. Messrs. Ford, Jenkins, Graham, McGurk

Psych. 317 (117). Personality (3)

A psychological interpretation of personality, its development, determinants, analysis, and relationship to successful adjustment. Prerequisite: Psych. 1. First semester. Mr. Graham

Psych. 320 (120). History of Psychology (3)

A historical approach to psychological facts, theories, fields, and methods. First semester. Mr. McGurk

Psych. 329 (129). Physiological Psychology (3)

The physiological basis of psychological processes. Two hours of discussion and two hours of laboratory work per week. Prerequisite: Psych. 1. First semester. Mr. Gross

Psych. 335 (135). Experimental Psychology (3)

Laboratory work and discussions covering sensory processes, simple reactions, and the more elementary aspects of perception. Two hours of discussion and three hours of laboratory work per week. Prerequisite: Psych. 1. First semester. Mr. Gross

Psych. 336 (136). Experimental Psychology (3)

Continuation of Psych. 335. Discussions and laboratory work on selected phases of attention, perception, learning, motivation, emotion and higher

thought processes. Two hours of discussion and three hours of laboratory work per week. Prerequisite: Psych. 335. Second semester. Mr. Gross

Psych. 351 (151). Industrial Training and Work Control (3)

The psychology of learning as applied to job training: incentives, labor relations, fatigue, job analysis, and work grading. Prerequisite: Psych. 1. First semester. Mr. Ford

Psych. 352 (152). Industrial Selection and Classification (3)

Psychological procedures for the selection and classification of employees. Two lectures and two hours of laboratory work per week. Prerequisite: Psych. 1. Second semester. Messrs. Ford, Jenkins

Psych. 354 (154). Psychological Design Factors (3)

The optimal psychological and physiological factors in instrument and machine design. Prerequisite: Psych. 1. Second semester. Mr. Jenkins

For Graduates

Graduate classes will be adjusted to student demand. Seminars and research will be conducted by Messrs. Ford, Graham, Gross, and Jenkins in fields of study appropriate to each staff member. See the Graduate Announcement for admission requirements.

Psych. 403 (203). Seminar in General Psychology (3)

Some significant aspect of psychological theory or principle, but varied from year to year in accordance with student needs. Prerequisite: six hours of psychology in fields related to the chosen topic.

Psych. 404 (204). Seminar in General Psychology (3)

Either a continuation of Psych. 403 or a new topic. Prerequisite: Psych. 403.

Psych. 405 (205). Seminar in Applied Psychology (3)

Some significant application of psychology. The topic will vary from year to year in accordance with student needs. Prerequisite: six hours of psychology in fields related to the chosen topic.

Psych. 406 (206). Seminar in Applied Psychology (3)

Either a continuation of Psych. 405 or a new topic. Prerequisite: Psych. 405.

Psych. 407 (207). Seminar in Clinical Psychology (3)

Reading assignments and discussions of assigned topics in the field of clinical psychology. Prerequisite: six hours of work in fields related to the chosen topic. First semester. Mr. McGurk

Psych. 409 (209). Systematic Psychology (3)

A critical approach to the methods, evidence, and theories of psychology; the building of an organization of basic principles. Mr. Jenkins

Psych. 410 (210). Systematic Psychology (3)

A continuation of Psych. 409. Prerequisite: Psych. 409. Mr. Jenkins

Psych. 411 (211). Psychological Research (3)

Assigned problems for investigation on a graduate level. Intended solely for majors in psychology.

Psych. 412 (212). Psychological Research (3)

Either a continuation of Psych. 411 or a new problem.

Psych. 414 (214). Advanced Experimental Psychology (3)

Psychological experiments selected for the graduate level. Two hours of discussion and three hours of laboratory work each week. Prerequisite: one course in experimental psychology beyond the level of general psychology. Second semester. Mr. Gross

*A reference list of new and old numbers will be found at the back
of the catalog.*

RELIGION

Assistant Professors A. M. Sherman and Bean

Relig. 11. Jesus and New Testament Religion (3)

Study of the Gospels of Matthew, Mark, Luke, and John, with emphasis on content; origin and nature of the New Testament. First semester.

Relig. 12. Paul and the Early Church (3)

Study of the New Testament Epistles, especially those of St. Paul, the Book of Acts, and the Book of Revelation, with emphasis on content; consideration of the situation which produced these writings. Second semester.

Relig. 13. Great Living Religions (3)

Study of Hinduism, Buddhism, the religions of China, Mohammedanism, Judaism, Christianity and Marxism in its religious aspects; the great ideas, institutions and history of each religion and their interrelationship; readings from the world's scriptures. Prerequisite: consent of the instructor. First semester.

Relig. 14. An Introduction to Judaism and Christianity (3)

More detailed consideration of the two major Western religions than in Relig. 13. Historical survey of Judaism and Christianity; relationship of the major branches of the two religions; comparison of the more important doctrines and practices. Second semester.

Relig. 15. The Old Testament and Hebrew Religion (3)

Methods of approach to Biblical study; history of the Hebrews, with emphasis on their unique religious development; the great teachings of the prophets and their application to present day problems. First semester.

Relig. 16. Problems of Religious Thought (3)

Consideration of such major problems as the nature and function of religion, the meaning of God, the religious interpretation of human nature, the problem of evil, reason and revelation, the meaning of history, and immortality; discussion of classic, medieval, and modern answers to these problems; readings in the works of the great theologians of the past and present. Second semester.

Relig. 17. Basic Christian Beliefs (3)

Discussion of such fundamentals of Christian faith as: God, Christ, the Holy Spirit, the Trinity, Creation, Redemption, Salvation, eschatology, etc. Emphasis on the basic doctrinal agreements among Christians. First semester.

Relig. 18. Christian Ethics (3)

Study of the ethical teachings of the Christian Church from Jesus to the present. Application of Christian ethical principles to personal and social problems of today, such as, sex and marriage, war and peace, labor and race relations etc. Second semester.

Relig. 19. Religion and Contemporary Society (3)

An analysis of the meaning of religion, the relation of religion and culture and the validity and importance of religion for the present day. Social, political and economic factors in our cultural development considered in their theoretical, historical and contemporary relation to religious factors. Prerequisite: Junior standing or consent of the instructor. First or second semester.

A reference list of new and old numbers will be found at the back of the catalog.

RESERVE OFFICERS' TRAINING PROGRAM

The Reserve Officers' Training Program at Lehigh University consists of the Army Reserve Officers' Training Corps and the Air Force Reserve Officers' Training Corps. The activities of this program are conducted under the Department of Military Science and Tactics and the Department of Air Science and Tactics.

An individual, usually the Senior officer on ROTC duty at Lehigh, appointed by the President of Lehigh University serves as Coordinator for the Reserve Officers' Training Program.

By action of the trustees and faculty of the University, the four-semester course of instruction in either Basic Military or Air Science and Tactics is required for graduation with a baccalaureate degree. Normally those students who have served three months or more in any branch of the Armed Forces of the United States are relieved of this requirement and are neither required nor expected to substitute academic work therefore. Eligibility to membership in the Basic Program is limited by law to students who are citizens of the United States between the ages of 14 and 23 years. Upon recommendation of the director of the Student's Health Service, a student may be exempted by reason of physical disability. Members of the University band are relieved from one semester of Basic Program for each semester of satisfactory participation in the band. Students transferring from other institutions may be exempt from part or all of the required number of hours in the Reserve Officers' Training Program, depending upon the amount of credit allowed at the time of admission. Students pursuing Military or Air Science courses may be deferred from induction under the Selective Service Law as long as they continue to satisfactorily pursue the academic and Military or Air Science courses of instruction.

Qualified students may apply for and be accepted into the Advanced Program, with a commission as Second Lieutenant in the United States Army or Air Force Reserves as the objective. To be eligible for consideration and admission to the advanced program, a student must be a citizen of the United States between the ages of 14 and 25 for Air Force, and between the

ages of 14 and 27 for Army, must be of good moral character, must have completed the Basic Course or received credit in lieu thereof, must successfully complete the prescribed physical examination, and must be pursuing an academic major which is closely related to a career training option offered at Lehigh University. The approval of the Professor of Military or Air Science and Tactics and the President of the University is also required for admission to the advanced program. All students enrolled in the advanced program are required to attend Summer Camp for six weeks, normally between the Junior and Senior years.

Students selected for admission to the advanced program are required to sign a written agreement to fulfill certain conditions prescribed by law and regulations. The student, by signing the contract, does not become a member of the Armed Forces of the United States and does not thereby assume any obligation for active military service.

Uniforms, textbooks and equipment are furnished by the government to basic students, but each student must provide footwear. Advanced students are furnished textbooks and equipment and given a uniform and subsistence allowances. A cash deposit of \$25.00 is required of all students at the time of registration. The deposit is refunded to the student upon his return of all issued property.

Department of Military Science & Tactics

Colonel Miller

Majors Harkins, Soverns and Schreiner

Captain Walter

Master Sergeants Moody, Partlow, Wall

Sergeant First Class Murphy

Sergeant Reed

An Infantry unit of the Reserve Officers' Training Corps was established at Lehigh University in September, 1919, an Ordnance unit in September, 1925, and an Engineer unit in September, 1947. The military courses are conducted under Department of the Army regulations and consist of two semesters of basic work common to all Army branches, two semesters of basic sub-

jects in branch specialties, and four semesters of advanced work along specialized lines.

For admission to the Advanced Engineer ROTC course, enrollment in an undergraduate engineering curriculum, accredited at the institution by the Council for Professional Development, is a prerequisite.

For admission to the Advanced Ordnance ROTC course, enrollment in an academic course of instruction leading to an engineering, technical or scientific degree is required.

Students enrolled in the Advanced Infantry ROTC course are normally selected from among Business and Arts majors.

Basic Courses

M.S. 1 (Mil. 1). Basic Course, First Semester (2)

Fundamental military training common to all Army branches including Military Organization, Military Policy of the U. S., Evolution of Warfare, Maps and Aerial Photographs, First Aid and Hygiene, Individual Weapons and Marksmanship, Military Problems of the U. S., and Leadership, Drill and Exercise of Command. Two recitations and two hours of drill a week. First semester.

M.S. 2 (Mil. 2). Basic Course, Second Semester (2)

Continuation of M.S. 1. Two recitations and two hours of drill a week. Second semester.

M.S. 3 (Mil. 3). Basic Infantry, First Semester (2)

Fundamental military training in Basic Infantry subjects, including Organization, Weapons, Marksmanship, Technique of Fire of Rifle Squad, Combat Formations, Scouting and Patrolling, Tactics of the Rifle Squad and Leadership, Drill and Exercise of Command. Two recitations and two hours of drill a week. First semester.

M.S. 4 (Mil. 4). Basic Infantry, Second Semester (2)

Continuation of M.S. 3. Two recitations and two hours of drill a week. Second semester.

M.S. 13 (Mil. 13). Basic Ordnance, First Semester (2)

Fundamental military training in Basic Ordnance subjects, including the Role of Ordnance, Automotive Materiel, Small Arms Materiel, Ammunition Materiel, Artillery Materiel, Fire Control Materiel and Leadership, Drill and Exercise of Command. Two recitations and two hours of drill a week. First semester.

M.S. 14 (Mil. 14). Basic Ordnance, Second Semester (2)

Continuation of M.S. 13. Two recitations and two hours of drill a week. Second semester.

M.S. 23 (Mil. 23). Basic Corps of Engineers, First Semester (2)

Fundamental military training in Basic Corps of Engineers subjects, including History and Traditions of the Corps of Engineers, Characteristics of Weapons, Camouflage, Defense against Chemicals, Explosives and Demolitions, Hand Tools and Rigging, Mines and Booby Traps, Organization and Tactics of Small Units, Organization of the Ground and Field Fortifications, and Leadership, Drill and Exercise of Command. Two recitations and two hours of drill a week. First semester.

M.S. 24 (Mil. 24). Basic Corps of Engineers, Second Semester (2)

Continuation of M.S. 23. Two recitations and two hours of drill a week. Second semester.

Advanced Courses

M.S. 5 (Mil. 5). Advanced Infantry, First Semester (3)

Advanced military training in Infantry subjects including Organization, Weapons, Gunnery, Communications, Combat Intelligence, Estimate of the Situation and Combat Orders, Field Fortifications, Tactics of Rifle and Heavy Weapons Platoons and Companies, and Leadership, Drill and Exercise of Command. Four recitations and two hours of drill a week. First semester.

M.S. 6 (Mil. 6). Advanced Infantry, Second Semester (3)

Continuation of M.S. 5. Four recitations and two hours of drill a week. Second semester.

M.S. 7 (Mil. 7). Advanced Infantry, Third Semester (3)

Advanced military training in Infantry subjects including Organization, Command and Staff, Communications, Motors and Transportation, Supply and Evacuation, Troop Movement, New Developments, The Military Team, Tactics—Infantry Battalion in Attack and Defense, Military Administration, Military Law, Military Teaching Methods, Psychological Warfare, Geographic Foundations of National Power, and Leadership, Drill and Exercise of Command. Four recitations and two hours of drill a week. First semester.

M.S. 8 (Mil. 8). Advanced Infantry, Fourth Semester (3)

Continuation of M.S. 7. Four recitations and two hours of drill a week. Second semester.

M.S. 15 (Mil. 15). Advanced Ordnance, First Semester (3)

Advanced military training in Ordnance subjects including Functional Organization of the Ordnance Corps, Automotive Materiel, Small Arms Materiel, Ammunition Materiel, Ammunition Supply, Artillery Materiel, Fire Control Materiel, Individual Weapons and Marksmanship, and Leadership, Drill and Exercise of Command. Four recitations and two hours of drill a week. First semester.

M.S. 16 (Mil. 16). Advanced Ordnance, Second Semester (3)

Continuation of M.S. 15. Four recitations and two hours of drill a week. Second semester.

M.S. 17 (Mil. 17). Advanced Ordnance, Third Semester (3)

Advanced military training in Ordnance subjects including Maintenance and Supply, Command and Staff, Combat Intelligence, Materiel Specialty, Military Administration, Military Law, Military Teaching Methods, Psychological Warfare, Geographical Foundations of National Power, and Leadership, Drill and Exercise of Command. Four recitations and two hours of drill a week. First semester.

M.S. 18 (Mil. 18). Advanced Ordnance, Fourth Semester (3)

Continuation of M.S. 17. Four recitations and two hours of drill a week. Second semester.

M.S. 25 (Mil. 25). Advanced Corps of Engineers, First Semester (3)

Advanced military training in Corps of Engineers subjects including Bridge Design and Classification, Engineer Signal Communications, Engineer Combat Intelligence, Engineer Supply, Military Roads and Runways, Organizations of Engineer Units, Organization of Combat Divisions, Tactics of Engineer Units, Vehicle Operation and Maintenance, Water Supply, Individual Weapons and Marksmanship, and Leadership, Drill and Exercise of Command. Four recitations and two hours of drill a week. First semester.

M.S. 26 (Mil. 26). Advanced Corps of Engineers, Second Semester (3)

Continuation of M.S. 25. Four recitations and two hours of drill a week. Second semester.

M.S. 27 (Mil. 27). Advanced Corps of Engineers, Third Semester (3)

Advanced military training in Corps of Engineers subjects including Engineer support for the Air Force, Engineer Support for the Communication Zone, Engineer Support for the Type Field Army, Command and Staff, Construction, Utilities and Job Management, Motor Movements, River Crossing Operations, Military Administration, Military Law, Military

Teaching Methods, Psychological Warfare, Geographical Foundations of National Power and Leadership, Drill and Exercise of Command. Four recitations and two hours of drill a week. First semester.

M.S. 28 (Mil. 28). Advanced Corps of Engineers, Fourth Semester (3)

Continuation of M.S. 27. Four recitations and two hours of drill a week. Second semester.

Department of Air Science and Tactics

Major Newman

Majors Baker, Kraemer and Onila

Captains Bradbury and Emrick

Master Sergeants Berezna, Hamilton, Lutz, Mick, Vlaun and Wilson

An Air Corps unit of the Reserve Officers' Training Corps was first established at Lehigh University in October 1946. Upon implementation of the National Defense Act of 1947, the Air Corps unit was reorganized and designated as the Air Force Reserve Officers' Training Corps. The Air Science courses are conducted under Department of the Air Force directives, and consist of four semesters of basic AF ROTC instruction and four semesters of Advanced AF ROTC instruction. In the Advanced Course, options are offered in the specialized fields of Air Force Administration and Logistics and Air Force Communications. For admission to Advanced Air Force Communications, enrollment in an academic major leading to an engineering, technical or scientific degree is required. Students enrolled in Advanced Air Force Administration and Logistics are normally selected from among Business and Arts majors.

Basic AF ROTC Courses

A.S. 1. Basic Air Science, First Semester (2)

Basic Air Force training covering Military Power in The Modern World, Foundations of Military Power, Global Geography, Maps and Aerial Photographs, Personal Maintenance, Command and Leadership Exercises. Two recitations and two hours of drill a week. First semester.

A.S. 2. Basic Air Science, Second Semester (2)

Continuation of A.S. 1. Two recitations and two hours of drill a week. Second semester.

A.S. 3 (Mil. 53, Mil. 63). Basic Air Science, Third Semester (2)

Fundamental training in Air Science subjects including Applied Air Power, Aerodynamics, Propulsion, Aerial Navigation, Meteorology, Seminar, Leadership, Drill and Exercise of Command. Two recitations and two hours of drill a week. First semester.

A.S.4 (Mil. 54, Mil. 64). Basic Air Science, Fourth Semester (2)

Continuation of A.S. 3. Two recitations and two hours of drill a week. Second semester.

Advanced AF ROTC Courses

A.S. 7 (Mil. 55). Advanced Air Force Administration and Logistics,
First Semester (3)

Advanced training in specialized and general Air Force Administration and Logistics subjects including Air Force Supply, Military and Commercial Transportation, Air Force Administration, Logistical Planning, Air Operations, Psychology of Leadership, Leadership, Drill and Exercise of Command. Four recitations and two hours of drill a week. First semester.

A.S. 8 (Mil. 56). Advanced Air Force Administration and Logistics,
Second Semester (3)

Continuation of A.S. 7. Four recitations and two hours of drill a week. Second semester.

A.S. 9 (Mil. 57). Advanced Air Force Administration and Logistics,
Third Semester (3)

Advanced training specialized and general Air Force Administration and Logistics, subjects including Purpose and Basic Functions of Staff, Administration of Personnel, Food Service Supervision, Officer Development, Air Force Management, Career Development, Military Teaching Methods, Military Law and Boards, Leadership, Drill and Exercise of Command. Four recitations and two hours of drill a week. First semester.

A.S. 10 (Mil. 58). Advanced Air Force Administration and Logistics,
Fourth Semester (3)

Continuation of A.S. 9. Four recitations and two hours of drill a week. Second semester.

A.S. 11 (Mil. 65). Advanced Air Force Communications,
First Semester (3)

Advanced training in specialized and general Air Force Communications subjects including Radio and Wire Communications, Radar, Visual and Aural Communications, Communications Supply and Maintenance, Voice and Command, Psychology of Leadership, Logistics, Air Operations, Leadership, Drill and Exercise of Command. Four recitations and two hours of drill a week. First semester.

A.S. 12 (Mil. 66). Advanced Air Force Communications,
Second Semester (3)

Continuation of A.S. 11. Four recitations and two hours of drill a week. Second semester.

A.S. 13 (Mil. 67). Advanced Air Force Communications,
Third Semester (3)

Advanced training in specialized and general Air Force Communications subjects including Command and Administration, Communications Training and Inspection, Functional Communications Systems, Communications Center and Message Handling, Communications Organization, Air Force Management, Military Teaching Methods, Military Law and Boards, Career Development, Leadership, Drill and Exercise of Command. Four recitations and two hours of drill a week. First semester.

A.S. 14 (Mil. 68). Advanced Air Force Communications,
Fourth Semester (3)

Continuation of A.S. 13. Four recitations and two hours of drill a week. Second semester.

*A reference list of new and old numbers will be found at the back
of the catalog.*

ROMANCE LANGUAGES

Professor Barthold

Associate Professor Soto, Assistant Professor Farné

Messrs. Isar, Roaten, and Chalos

FRENCH

Fr. 1. Elementary French (3)

Basic French grammar illustrated by oral and written exercises. Attention paid to correct pronunciation of simple spoken French. No previous study of French required. First semester.

Fr. 2. Elementary French (3)

Continuation of Fr. 1, with the addition of the use of simple vocabulary-building texts. Prerequisite: Fr. 1. Second semester.

Fr. 11. Intermediate French (3)

Reading based on works of the nineteenth and twentieth century writers; formal review of French grammar; prose composition; outside reading. Prerequisite: *one year of college French or two units of entrance French.* First semester.

Fr. 12. Intermediate French (3)

Continuation of Fr. 11. Prerequisite: Fr. 11. Second semester.

Fr. 13. Types of French Literature (3)

Training in the ability to read and understand representative works from the seventeenth century to the present day. Prerequisites: Fr. 11 and 12, or three units of entrance French. First semester.

Fr. 14. Types of French Literature (3)

Continuation of Fr. 13. Prerequisite: Fr. 13. Second semester.

Fr. 21. Seventeenth Century French Literature (3)

The age of classicism. Lectures, study of texts, collateral readings, and reports. Prerequisites: Fr. 13 and 14. First semester.

Fr. 22. Eighteenth Century French Literature (3)

The rise of liberalism as reflected in the writings of Montesquieu, Diderot, Rousseau, and Voltaire. Prerequisites: Fr. 13 and 14. Second semester.

Fr. 31. Nineteenth Century French Literature (3)

Main literary currents of the nineteenth century; romanticism and realism: Lectures, reports, collateral readings. Prerequisites: Fr. 13 and 14. First semester.

Fr. 32. Nineteenth Century French Literature (3)

Continuation of Fr. 31. Prerequisite: Fr. 31. Second semester.

Fr. 41. French Oral and Written Composition (3)

For students who wish a greater opportunity for practice in the oral and written use of French than can be provided in the literature courses. Prerequisites: Fr. 13 and 14. First semester.

Fr. 42. French Oral and Written Composition (3)

Continuation of Fr. 41. Prerequisites: Fr. 41. Second semester.

For Advanced Undergraduates and Graduates

Fr. 221 (101). French Literature before the Seventeenth Century (3)

Survey of French literature from its beginning through the sixteenth century. Prerequisites: Fr. 31 and 32, or the equivalent. First semester.
Mr. Barthold

Fr. 222 (102). Contemporary French Literature (3)

Prerequisites: Fr. 31 and 32, or the equivalent. Second semester.

Mr. Farné

Fr. 223 (103). Proseminar (3)

Study of the works of some author or group of authors or of a period.
Prerequisites: Fr. 31 and 32, or the equivalent. First semester.

Mr. Barthold

Fr. 224 (104). Proseminar (3)

Continuation of Fr. 223. Second semester.

Mr. Farné

ITALIAN

Ital. 1. Elementary Italian (3)

Grammar; composition; rapid reading of easy modern prose. No previous study of Italian required. First semester.

Ital. 2. Elementary Italian (3)

Continuation of Ital. 1. Prerequisite: Ital. 1. Second semester.

Ital. 11. Intermediate Italian (3)

The age of Dante. Lectures in English on Dante and his contemporaries; readings in the *Divina Commedia*. Prerequisites: Ital. 1 and 2. First semester.

Ital. 12. Intermediate Italian (3)

Continuation of Ital. 11. Second semester.

PORTUGUESE

Port. 1. Elementary Portuguese (3)

A study of Portuguese grammar and forms; practice in writing and speaking Portuguese. Prerequisite: consent of the instructor. First semester.

Port. 2. Elementary Portuguese (3)

Continuation of Port. 1. Second semester.

SPANISH

Span. 1. Elementary Spanish (3)

Basic Spanish grammar illustrated by oral and written exercises. Attention paid to correct pronunciation of simple spoken Spanish. No previous study of Spanish required. First and second semesters.

Span. 2. Elementary Spanish (3)

Continuation of Span. 1, with the addition of the use of simple vocabulary-building and reading texts. First and second semesters.

Span. 11. Intermediate Spanish (3)

Reading of modern Spanish prose, with a view to acquiring exactness and speed in reading; rapid review of grammar with prose composition. Prerequisite: *one year of college Spanish or two units of entrance Spanish*. First semester.

Span. 12. Intermediate Spanish (3)

Continuation of Span. 11. Prerequisite: Span. 11. Second semester.

Span. 21. Introduction to Modern Spanish Fiction (3)

Reading and discussion of selected novels and short stories; outside reading and reports. Prerequisites: Span. 11 and 12, or three units of entrance Spanish. First semester.

Span. 22. Introduction to Modern Spanish Drama (3)

Reading and discussion of selected plays; outside reading and reports. Prerequisite: Span. 21. Second semester.

Span. 31. Spanish Oral and Written Composition (3)

For students who wish a greater opportunity for practice in the oral and written use of Spanish than can be provided in the literature courses. Prerequisite: *consent of the head of the department*. First semester.

Span. 32. Spanish Oral and Written Composition (3)

Continuation of Span. 31. Second semester.

For Advanced Undergraduates and Graduates

Span. 221 (101). Spanish Fiction of the Golden Age (3)

The Spanish novel of the sixteenth and seventeenth centuries, with special attention to Cervantes' *Don Quixote*. Lectures, collateral reading, and reports. Prerequisites: Span. 21 and 22. First semester. Mr. Soto

Span. 222 (102). Spanish Drama of the Golden Age (3)

Selected plays by Lope de Vega, Tirso de Molina, Ruiz de Alarcón, and Calderón. Lectures, collateral reading, and reports. Prerequisites: Span. 21 and 22. Second semester. Mr. Soto

Span. 223 (103). Proseminar (3)

A study of the works of some author or group of authors or of a period. Prerequisites: Span. 21 and 22. First semester.

Span. 224 (104). Proseminar

Continuation of Span. 223. Second semester.

Span. 231 (111). Spanish American Literature (3)

Brief survey of the whole field of Spanish American literature, with emphasis on works of modern writers. Prerequisites: Span. 21 and 22. First semester.

Mr. Soto

Span. 232 (112). Spanish American Literature (3)

Continuation of Span. 231. Second semester.

Mr. Soto

SOCIOLOGY

See Economics and Sociology

Division of Athletics and Physical Education

P. L. SADLER, *Director*

P. E. SHORT, *Assistant Director and Business Manager*

E. F. CARAWAY, *Assistant Director and Program Manager*

F. C. BARTLETT, *Assistant Director of Physical Education*

The Division consists of the Department of Intercollegiate Athletics and the Department of Physical Education and Intramural Sports. It has supervision over the entire field of intercollegiate athletics and physical education. Its activities consist of intercollegiate athletics, intramural athletics, required physical education, including corrective exercises, and special courses of instruction in preparation for coaching and teaching physical education.

Experience indicates that it is essential that the physical education program emphasize the physical fitness and efficiency benefits to be derived from a well-rounded and athletic phase of the program. The purpose of the athletic, physical education, and intramural sports program is designed to:

- a. Raise and maintain the physical standards of the University.
- b. Develop and maintain a high level of all-around physical fitness so that the undergraduate student may more readily assimilate instruction.
- c. Encourage regular and healthful exercise by the development of skills, techniques, and attitudes.
- d. Foster an aggressive and cooperative team spirit, to increase the confidence of the individual, to develop sportsmanship, and to increase university pride through participation in vigorous competitive athletics.

Facilities for accomplishing this aim and purpose are afforded in Taylor Gymnasium, Grace Hall, the field house, the two playing levels of Taylor Field, and Lehigh Field.

DEPARTMENT OF INTERCOLLEGIATE ATHLETICS

Director Sadler

Assistant Directors Short and Caraway

Messrs. Sheridan, Leckonby, Packer, Whitton, Cooley, Leeman,
Christian, Dockham, Reno, and Havach

The Department of Intercollegiate Athletics offers opportunity to the undergraduate student body to participate in intercollegiate competition both at home and away with institutions which are Lehigh's natural rivals and also other institutions which are at some distance.

The intercollegiate program consists of varsity teams in football, cross country, soccer, wrestling, basketball, swimming, tennis, track, baseball, golf, lacrosse, hockey, and fencing, junior varsity teams in football, wrestling, basketball, swimming, and baseball, as well as freshman teams in most of the above sports.

DEPARTMENT OF PHYSICAL EDUCATION
AND INTRAMURAL SPORTS

Professor Sadler

Assistant Professors Bartlett, Caraway, Christian, Dockham,
Whitton, Leeman, and Packer

The Department of Physical Education and Intramural Sports has supervision and control of the required recreational physical activities of the student body. The aim of the department is to insure the health and physical development of every student of the University.

Through its program in physical education and intramural sports the University endeavors to maintain among its students a high degree of physical fitness, to establish habits of regular and healthful exercise, to foster the development of such valuable by-products as self-confidence, good sportsmanship, and a spirit of cooperation, and to provide each student with ample opportunity for acquiring an adequate degree of skill in sports of the type in which participation can be continued after graduation.

All students are required to engage in some form of activity under departmental supervision. This requirement calls for three hours a week in the gymnasium for Freshmen and Sophomores, two hours a week for Juniors and one hour a week for Seniors, or participation in an organized sport.

Each student is given an annual physical examination by the director of the Students' Health Service, assisted by the department of physical education. He is advised as to postural and physical defects.

All freshmen are required to take a physical efficiency test for the purpose of classification and development. All students are required to participate in some form of activity under departmental supervision. This requirement calls for three hours a week in the gymnasium or participation, under the supervision of the department, in an organized sport. In the gymnasium, opportunity is offered in the following activities: mass exercises, mass swimming, beginners' swimming, boxing, fencing, apparatus exercises, handball, life-saving, badminton and sports fundamentals. All undergraduate students must swim 75 feet before graduation. Students are encouraged to change their activities whenever it is thought best for their all-around development.

A comprehensive program in intramural sports is sponsored for the student body including fraternity, dormitory, interclass, town, and independent groups in touch football, tennis, soccer, badminton, handball, individual athletics, basketball, swimming, wrestling, track, softball, volleyball, and recreative games. Students are encouraged to participate in these sports, and awards are given for excellence in performance.

Individual exercises are prescribed for the correction of physical and functional defects. Students of this group are carefully examined and individually guided.

The University maintains a well-equipped dispensary for medical treatment. If a student is injured while engaged in any sport he must report as soon as possible to the director of the Students' Health Service.

The following physical education courses are required of all physically qualified students:

P.E. 1. Physical Education

Freshman first semester. 3 hrs. per week.

P.E. 2. Physical Education

Freshman second semester. 3 hrs. per week.

P.E. 3. Physical Education

Sophomore first semester. 3 hrs. per week.

P.E. 4. Physical Education

Sophomore second semester. 3 hrs. per week.

P.E. 5. Physical Education

Junior first semester. 2 hrs. per week.

P.E. 6. Physical Education

Junior second semester. 2 hrs. per week.

P.E. 7. Physical Education

Senior first semester. 1 hr. per week.

P.E. 8. Physical Education

Senior second semester. 1 hr. per week.

For Sophomores, Juniors, and Seniors

In addition to courses designed to provide healthful and recreative exercise for all students, the department of physical education offers work preparatory to the teaching of physical education and the coaching of athletics, which may be elected by qualified members of the sophomore, junior, and senior classes. They are primarily for those students who are preparing for professional careers in teaching and athletic coaching. They are also open to other students who are interested in a study of coaching and physical education.

P.E. 22. Football Coaching, Conditioning, and Equipping (3)

Classroom and field instruction in the play of each individual position; intensive study of the football rules and of various systems of attack and defense. Prerequisite: sophomore standing. Second semester.

P.E. 23. The Organization and Administration of Physical Education (2)

THEORY. Organization and supervision of physical education programs; history of physical education systems; administration of intramural activities; qualifications of physical educators; methods of teaching; planning of programs. Prerequisites: Educ. 1, sophomore standing. First and second semesters.

P.E. 24. The Organization and Administration of Physical Education (1)

PRACTICE. The practice of teaching mass physical activities including athletics, combative events, gymnasium games, apparatus, stunts, and efficiency tests. Programs of corrective exercises for postural defects are considered. Three hours practice a week. Prerequisites: sophomore standing. First and second semesters.

P.E. 30. Baseball and Basketball Coaching, Conditioning, and Equipping (3)

Technique of individual positions in baseball, together with systems of attack and defense; fundamentals of basketball, including stops, turns, passes, zone defense, man-to-man defense, and different styles of attack. Prerequisites: sophomore standing. First semester.

P.E. 31. Track, Wrestling, and Swimming Coaching, Conditioning, and Equipping (3)

Theory and application of fundamentals, including form in the various track events, holds and defenses in wrestling, and the various strokes and dives in swimming; proper training and conditioning for each of these sports. Prerequisites: sophomore standing. Second semester.

P.E. 32. The Administration of High School and Preparatory School Athletics (3)

Arrangement of schedules, budget-making, and care of equipment; responsibility for prevention of athletic injuries and for care of the injured; methods of protecting against injury; immediate care and final treatment of injuries; return to athletics after injury. Prerequisites: Educ. 1, sophomore standing. First and second semesters.

General Information

General Regulations

Eligibility for Degree

In order to be graduated, a candidate for a baccalaureate degree must either receive a grade of C or better in at least half of the hours taken in residence and presented for graduation or attain an average of 1.80 or better for all hours taken in residence and offered for graduation.

To be eligible for a degree from Lehigh University, a student not only must have completed all of the scholastic requirements for the degree, but also he must have paid all University fees, and in addition all bills for the rental of rooms in the dormitories, or for damage to University property or equipment, or for any other indebtedness to the University. It is understood, however, that this regulation does not apply to any indebtedness for scholarship loans or for loans from trust funds administered by the University which are protected by properly executed notes approved by the treasurer.

Final Date for Completion of Requirements

For graduation all requirements, scholastic and financial, must have been met by 12 o'clock noon on the Friday preceding the graduation exercises.

Notice of Candidacy for Degree

Candidates for graduation on University Day file with the registrar on or before May 15 a written notice of candidacy for the degree; candidates for graduation on Founder's Day file a similar notice of candidacy on or before September 10. Failure to file such notice by the dates mentioned debars the candidate from receiving the degree at the ensuing graduation exercises.

Graduating Theses

Undergraduate theses, when required, are accompanied by drawings and diagrams, whenever the subjects need such illustration. The originals are kept by the University, as a part of the student's record, for future reference; but copies may be retained by students, and may be published, provided permission has first been obtained from the faculty.

Credit and Grades

Credit is reckoned in semester hours. A semester hour is a course unit involving a total of three clock hours of effort on the part of the student each week for a semester.

Final grades in courses are A, B, C, D, and F. A, B, C, and D are passing. F indicates failure. Physical education is marked P (passing) or F (failure) without hour credit.

In cases of withdrawal from courses after the tenth day of instruction the symbols WP (withdrawn, passing) and WF (withdrawn, failure) are used.

The letters "Abs." (absent) are used to indicate absence from a final examination in a course. The grade of "Abs." is reported with a letter grade in parentheses, such letter grade representing the department's estimate of the student's work up to the close of instruction, with the provision that in cases where a department does not feel justified in reporting an estimated grade, a report of "Abs. (X)" will be returned.

The letters "Inc." are used to indicate that the work in a course is incomplete. The grade is accompanied by a letter grade. A student who incurs an "incomplete" in any course and fails to remove the "incomplete" within one calendar year, loses all equity in the course.

HONORS

Honors are of three kinds: class honors, graduation honors, and special graduation honors.

Class Honors

Upon completion of the work of the freshman and sophomore years, on recommendation of the registrar and by vote of the faculty, class honors are awarded to those individuals who have made an average of 3.00 or better during the preceding year.

The names of these students are announced at the graduation exercises at the end of each semester and published in the University Register.

Graduation Honors

Degrees "with honors" are awarded by vote of the faculty to those students who have attained an average of not less than 3.00 in their last two years' work at the University.

Degrees "with high honors" are awarded by vote of the faculty to those students who have attained an average of not less than 3.50 in their last two years' work at the University.

Degrees "with highest honors" are awarded by vote of the faculty to those students who have attained 3.75 in their last two years' work at the University.

Candidates for graduation who have been in residence at the University for less than two years are not eligible for graduation honors.

Graduation honors are announced at the graduation exercises.

In computing the averages of candidates for graduation honors, semester grades are weighted according to the number of credit hours in the course concerned on the basis: A equals 4, B equals 3, C equals 2, D equals 1, and F equals 0.

Special Honors

Special honors are awarded at the end of the senior year, on recommendation of the head of the department concerned and by vote of the faculty, to students who have done advanced work of unusual merit in some chosen field. Candidates for special honors must indicate to the head of the department concerned and to the registrar during the junior year their intention to work for such honors. Awards are based on grades obtained in the subject chosen, the results in extra work assigned, and the general proficiency of the candidate as evidenced either by a final examination or a thesis, as the head of the department involved may direct. Special honors are announced at the graduation exercises.

Financial Aid

UNDERGRADUATE SCHOLARSHIPS AND LOANS

GENERAL STATEMENT

For students needing financial aid to attend Lehigh University, two types of assistance are available: tuition scholarships and tuition loans.

ELIGIBILITY.

New Students: Freshmen

New students are eligible to apply for the following scholarships, but only if they are not transferring from another college:

1. Competitive Regional Scholarships (page 282).
2. Trustee Scholarships (page 283).
3. Endowed Scholarships, within the conditions of each scholarship's restrictions as stipulated in the description below (pages 284, 286).

A freshman who barely meets the minimum scholastic standard specified below is qualified to enter competition for financial aid; but funds available are awarded on a competitive basis. Only a candidate who ranks well up in the top fifth of his graduating class, who does well in his College Entrance Examination Board tests, or who has achieved some distinction in non-academic activity, should expect success in the competition.

New Students: Transfers

A student transferring from another four-year college, unless he has been graduated, is not eligible to apply for a tuition scholarship until he has completed one year of residence at Lehigh University.

A student entering from a recognized junior college with full transferred credits (junior standing) may be a candidate for a tuition scholarship on his junior college record.

Students Currently Enrolled

Students who are already enrolled at Lehigh and have been in residence for one college year or more are eligible to apply for any of the tuition scholarship or loan awards, with the excep-

tion of the Competitive Regional Scholarships, competition for which is open only to prospective freshmen at the time of their application for admission.

Veterans

Students entering or returning to Lehigh under the benefits of government subsidies for education as provided by Public Law 16 or Public Law 346 normally are not eligible for tuition scholarship awards. The only exceptions are former Lehigh students who held tuition scholarships before they left for service and whose educational benefits under the provisions of Public Law 346 are inadequate to cover their entire educational program. Such students should consult the Dean of Students for further information regarding these special provisions.

Special financial aid in the form of loans or grants is also available to enrolled veterans whose government benefits are inadequate to meet their necessary expenses or who need temporary financial assistance pending receipt of their subsistence checks from the government.

APPLICATION. Candidates for scholarships or loans must make application on forms provided by the committee on scholarships and loans. Candidates not previously enrolled in the University should write for the form to the Office of Admissions; candidates who have been enrolled in the University one semester or longer should write to the Dean of Students. Dates for filing applications are:

1. Before March 1, for entering freshmen and transfer students from other colleges.
2. Before May 15, for sophomores, juniors, or seniors who have been in residence for one or more academic years. It is to a candidate's advantage to send in his application by May 1.

Any application for scholarship aid not conforming to the above procedures can be given consideration only if funds are still available when a late application is received.

All requests must be based on a budget for at least a full academic year (two semesters).

ACCEPTANCE. All new students to whom scholarships or loans are awarded, must signify their acceptance of the award within ten days, at the same time sending in the formal acceptance of admission with the \$50.00 admission deposit, unless this has already been attended to. Awards are automatically withdrawn after ten days if these terms have not been fully met.

TUITION SCHOLARSHIPS

Competitive Regional Scholarships

Lehigh University offers each year ten scholarships valued at \$3,200.00 each, for four years of college work, which are reserved for entering freshmen and awarded on a competitive basis. These scholarships provide an award of \$400.00 each semester for eight semesters, in any of the undergraduate curricula of the University.

The scholarships once assigned continue in force for the full four years of the student's residence at Lehigh University, unless the holder fails to meet the scholastic requirement of a 2.50 average or better and the qualifications of a good citizen. The award is based strictly on merit, irrespective of the need for financial aid.

In order to compete for one of these scholarships, a freshman candidate must take the following steps:

1. Write a letter to the Office of Admissions of Lehigh University indicating his intention to compete and requesting a form on which to submit his application.

The application should be received by the Office of Admissions before March 1 of the calendar year in which the applicant expects to enter the University.

2. Submit a record of his secondary school preparation, which must meet all entrance requirements for the particular college he wishes to enter. A preliminary record must be submitted, on forms which will be provided, as soon as possible after the close of the first semester of the senior or final year of secondary school preparation.

3. Submit on the form provided a complete record of his secondary school extra-curricula activities, to which should be added information regarding any important piece of creative work, independent study, or other notable accomplishments which do not appear in his regular record submitted for admission. His guidance officer must attest the accuracy of this record.

4. Ask his principal or headmaster to send to the Office of Admissions of Lehigh University a general character recommendation and a general estimate of his fitness to do college work.

5. Compete in certain examinations offered under the auspices of the College Entrance Examination Board, as assigned by the Office of Admissions.

Awards will be made in the order of the contestants' ratings on such weighted factors as secondary school scholastic record, evidences of effective leadership and distinguished group service, character and personality, and performance in the competitive examinations, the last factor being the most heavily weighted.

Awards will be assigned geographically, two each to the New England States and the Middle Atlantic States, three to the South-eastern States, and three at large. However, if in any year the candidates in any area do not show total weighted ratings reasonably commensurate with the ratings of runners-up in other geographical divisions, one or more of the awards to that area may lapse for that year and be assigned to superior candidates from other geographical divisions.

Further details regarding the taking of the examinations and the records to be submitted will be forwarded to applicants upon request.

Address all communications to: The Office of Admissions, Lehigh University, Bethlehem, Pennsylvania.

Trustee Scholarships

By action of the board of trustees, a number of free scholarships are awarded annually to undergraduate students. The usual award amounts to one-half the tuition payment, giving full and final remission of one-half of each semester's tuition charge. In exceptional cases an award may be made in the amount of the full tuition charge. (See also "Tuition Loans" below.)

The bases of award for trustee scholarships are: (1) financial need, (2) character and personality, (3) leadership qualities and participation in school or college activities other than scholastic, and (4) high scholastic achievement. "High scholastic achievement" for a freshman is evidenced by rank in his secondary school graduating class and by performance in the scholarship examina-

tions of the College Entrance Examination Board; for the student already enrolled, by his semester grade averages.

The committee on scholarships and loans must be thoroughly convinced that the student is unable to pay his tuition in full or part and that, with the tuition aid granted, the student will be fully able to finance himself for the year with no serious difficulty. The burden of positive proof on these points is placed on the student. An inquiry form regarding financial status is a part of the application-for-aid form.

Evidence must be presented of excellence of character and personality.

Other factors being equal, preferential consideration may be given to the student who, in addition to making a meritorious scholastic record, has also been able to demonstrate successful leadership in one or more non-scholastic activities in school or on campus.

Each scholarship is awarded for one college year only. However, a student receiving such an award may apply on his record for a further award for the following year, with the expectation that it will be continued unless his scholastic average falls below 2.00 for the preceding college year (two semesters).

The minimum scholastic requirement is, in the case of a freshman, rank in the top third of his graduating class in high school or preparatory school, and in the case of a sophomore, junior, or senior, an average grade during the previous academic year of 2.00 or better. (Average grades are computed by weighting A as 4, B as 3, C as 2, D as 1, and F as 0.) College Board scores are comparative; the minimum score required of candidates varies with the competition.

Endowed Scholarships

Income from endowments made by alumni and friends of Lehigh University provide limited funds for tuition scholarships.

The bases for these awards are the same as for the awards of trustee scholarships (page 283), subject to the restrictions in the deeds of gift, which often make these funds available only to students meeting certain specified stipulations. Descriptions of these endowed scholarships may be found below (page 286).

TUITION LOANS

Where a student's need for financial aid is not fully met by the free tuition scholarship award granted him, further aid may be granted in the form of a tuition loan to supplement the free tuition award. Under some circumstances, only a tuition loan is granted the applicant.

New students must meet the same qualifications to secure a tuition loan as to receive a tuition scholarship as described above. If an applicant's scholastic rating did not qualify him for a free tuition award adequate to cover his tuition needs, the supplementary tuition loan may still enable him to attend Lehigh University. Where it is deserved, this supplementary award generally will be made to the student without further application by him.

For students who have completed two or more semesters in residence at Lehigh, tuition loans are made on the basis of merit and need, at the discretion of the committee on scholarships and loans, and to the extent that loan funds are available.

No loan can be made to a student on scholastic or disciplinary probation. The maximum indebtedness to the University that any student may normally incur is \$1400.00.

The student signs a note for any tuition loan, endorsed by his parent or guardian, agreeing to start repayments within three months from the date of his leaving the University for whatever cause, and at the rate of at least \$25.00 per month until the full amount of the total indebtedness has been repaid.

TIME LIMIT FOR REPAYMENT. Every student incurring indebtedness to the University is required to undertake to pay his debt in full within five years after his graduation or withdrawal, according to a schedule to be agreed upon. In cases involving the maximum debt of \$1400.00, the payment of the principal, at the rate of at least \$25.00 per month, should be completed within four years and three months. All payments are applied first to the reduction of the principal of the debt.

INTEREST ON TUITION LOANS. Indebtedness incurred through tuition loans bears no interest so long as the student is in residence. From the date of graduation or withdrawal, such indebtedness bears interest at the rate of 3% for the first and second years, 4% the third and fourth years, and 5% thereafter.

DESCRIPTIONS OF ENDOWED SCHOLARSHIPS

The Ray Sands Nostrand Memorial Scholarship

The Ray Sands Nostrand Memorial Scholarship was established by the late Benjamin Nostrand, Jr., M.E., '78, in memory of his son, Ray Sands Nostrand, '17. The income from this fund is awarded to students of the University. The requirements governing the awards of University scholarships apply likewise to this scholarship.

The Fred. Mercur Memorial Fund Scholarship

Friends of the late Frederick Mercur, of Wilkes-Barre, Pa., General Manager of the Lehigh Valley Coal Company, desiring to establish a memorial of their friendship and esteem, and to perpetuate his memory, contributed and placed in the hands of the trustees of the University a fund called the Fred. Mercur Memorial Fund. The income from this fund is awarded to students of the University. The requirement governing the award of University scholarships apply likewise to this scholarship.

The Henry S. Haines Memorial Scholarship

Mrs. Henry S. Haines, of Savannah, Ga., established in 1889 a scholarship of the annual value of \$100.00 as a memorial to her son, Henry Stevens Haines, M.E., '87. By the terms of the bequest this scholarship is awarded to a student in the curriculum in mechanical engineering. The requirements governing the award of University scholarships apply likewise to this scholarship.

The William S. Cortright Memorial Scholarship

Mrs. William S. Cortright established in 1938 a fund, the income from which provides a scholarship annually in memory of her husband, who graduated from Lehigh University in 1872. By the terms of the bequest this money is to be used for the maintenance of a part-tuition scholarship, to be awarded to a student who is a resident of Bethlehem or the immediate vicinity and who is enrolled in the curriculum of mechanical engineering. The award is to be made by the committee on scholarships and loans under the regular requirements governing the award of other University scholarships.

The Natt Morrill Emery Scholarship

Established in memory of the late Natt Morrill Emery, vice-president and controller of Lehigh University, by an alumnus and former student of Dr. Emery's, the Natt Morrill Emery Scholarship covers the full tuition fee. It will be awarded by Lehigh University every four years (or whenever it becomes vacant) to that graduate of the high schools of Richmond, Virginia, selected by the Richmond school authorities, who during his scholastic career has exemplified in character and conduct the qualities of loyalty and ability which marked the services of Dr. Emery to Lehigh University.

The Murtha P. Quinn Scholarship

Mr. Murtha P. Quinn left one-thirtieth of his residual estate to Lehigh University for the purpose of establishing a free tuition scholarship in the amount of \$400.00 annually. Preference is to be given to students whose homes are in South Bethlehem.

Scranton Public High School Scholarships

Four scholarships, provided through the gifts of a friend of Lehigh University, are to be awarded, one each year, to graduates of the public senior high schools of Scranton, Pennsylvania, of which there are now two, viz: Central High School and Technical High School. The scholarship is to cover the tuition fee of the holder thereof.

A scholarship award is to be renewed yearly to the initial holder thereof until he graduates, provided he remains in school and maintains a grade at least equal to the average of his class during the preceding year.

The following qualifications only are to be the basis of the award of the scholarships: (a) a good character; (b) need of pecuniary assistance; (c) high scholastic ability. The awarding of these scholarships will be administered through the committee on scholarships and loans.

At the discretion of the president, each scholarship may be divided into two or more partial scholarships totaling one full scholarship, so that two or more may benefit by any annual award.

If at any time the income from the funds should warrant, two scholarships may be awarded in one year. If at any time the ac-

cumulated income is not sufficient to pay the full amount of the tuition fee, the scholarship shall be awarded nevertheless, the balance being taken from the principal of the fund.

The Luther Rees Zollinger Memorial Fund

The sister of Luther Rees Zollinger left the residue of her estate to Lehigh University to establish this memorial fund to provide tuition scholarships for worthy students who are in need of financial assistance. The awards are to be made by the committee on scholarships and loans, under the regular requirements governing the award of other University scholarships.

The Samuel Foster York Memorial Scholarship Fund

This fund was established by Warren W. York, of the Class of 1924, as a memorial to his father, Samuel Foster York. The income is to be applied towards tuition scholarships for needy and worthy graduates of Allentown, Pennsylvania, secondary schools who desire to pursue business administration courses at Lehigh University. The award is to be made by the committee on scholarships and loans under the regular requirements governing the award of other University scholarships.

The Theophil H. Mueller Class of 1918 Scholarship Fund

This fund was established by Theophil H. Mueller, an alumnus trustee of the University. The income is to be used to assist in defraying the expenses of some worthy student or students who are in need of financial assistance, provided, however, that if it is possible and advisable the student or students selected to receive such financial assistance shall be of the Moravian faith and preferably from Bethlehem, Pennsylvania, or its environs. Awards are to be made by the committee on scholarships and loans, under the regular requirements governing the awarding of other University scholarships.

The John R. W. Davis Memorial Scholarship Fund

This fund was established by Mrs. John R. W. Davis, of Seattle, Washington, in memory of her husband, John R. W. Davis, C.E., Class of 1891. The income is to provide for scholarships in civil engineering for meritorious students in need of financial

assistance. Awards are to be made by the committee on scholarships and loans, under the regular requirements governing the awarding of other University scholarships.

The Jacob B. Krause Scholarship Foundation

The Jacob B. Krause Scholarship Foundation was established under the will of Jacob B. Krause, class of 1898, for the purpose of assisting needy students in the College of Arts and Science. Scholarships are to be awarded only to male students who maintain good scholastic standing and are in need of financial help. The awards are to be made by the committee on scholarships and loans under the regular requirements governing the award of other university scholarships.

Isadore Raiff Memorial Fund Scholarship

The fund was established by the Rayless Department Stores, New York City, in honor and in memory of their late President, Isadore Raiff. The income from the fund is to be used to award a scholarship to worthy students in the College of Business Administration. Preference will be given to candidates from the states of Georgia, New York, North Carolina, South Carolina, Tennessee, and Virginia. The award is to be made by the Committee on Scholarships and Loans under the regular requirements governing the award of other university scholarships.

The David R. Thomas Memorial Fund

This fund was established by Professor and Mrs. Harold P. Thomas after their son's death in a plane crash on South Mountain in June, 1950. Donations from friends and family have been included in the fund. The income is to be used for tuition scholarships for one or more students who have completed at least one year at Lehigh University and are in need of financial assistance to complete their education. The award or awards will be made to students who exemplify in their lives the high ideals which were characteristic of David up to his untimely death.

The Bethlehem Fabricators' Scholarship Fund

This fund was established by Bethlehem Fabricators, Incorporated to provide tuition scholarships for students who are in

need of assistance. Character and personality, high scholastic achievement and leadership qualities shall be given consideration when these awards are made. Other qualifications being equal, preference shall be given to candidates applying from the Counties of Lehigh or Northampton in Pennsylvania.

The J. D. Berg Scholarship Fund

This fund was established by Mrs. J. D. Berg in memory of John Daniel Berg, ME '05, who devoted many years to Lehigh University as Alumnus and as Trustee. An annual scholarship of \$1000 shall be awarded to a student who is in financial need and has prerequisites of character and personality, high scholastic achievement and leadership qualities which merit the award. Preference shall be given to students residing in the West Pennsylvania District and who enroll in an Engineering Curriculum at Lehigh University.

The Bernard H. Jacobson Fund

This fund was established by Mr. Bernard H. Jacobson, a graduate from Lehigh University in Electro-Metallurgy, in the Class of 1917. The income is to be used to provide financial aid, usually to the amount of the tuition, for one or more students as the income may provide, who shall show financial need, good character and personality, high scholastic achievement and qualities of leadership.

DESCRIPTION OF LOAN FUNDS

The Eckley B. Coxe Memorial Fund

In memory of the late Eckley B. Coxe, trustee of the University, Mrs. Coxe established a fund, amounting to \$70,000.00, the interest of which is used, under the direction of the trustees of the University and subject to such regulations as they may adopt, for the assistance of worthy students requiring financial aid.

The Frank Williams Fund

Frank Williams, B.S. '87, E.M. '88, who died in October, 1900, bequeathed to the University the greater part of his estate

to found a fund, now amounting to \$245,000.00, the income of which is loaned to deserving students.

The Frazier and Ringer Memorial Fund

The Frazier and Ringer Memorial Fund was established in 1906 by the late Robert H. Sayre, in memory of Benjamin West Frazier, A.M., Sc.D., former professor of mineralogy and metallurgy, and Severin Ringer, U.J.D., former professor of modern languages and literature and of history, each of whom served Lehigh University for one-third of a century. The income from the fund and payments made by former borrowers are available for loans to cover the medical and surgical care of worthy students.

The President's Fund

The President's Fund was established during the early years of the University for the help of deserving students. As payments are made by former beneficiaries, they are immediately available for the assistance of students of the University.

GRADUATE SCHOLARSHIPS, FELLOWSHIPS AND LOANS

University Scholarships and Loans

The board of trustees has authorized the annual award of twelve free-tuition scholarships and twelve deferred-payment scholarship loans to graduate students, the former to be assigned on the basis of superior qualifications, the latter granted on the basis of qualifications and need.

In general these scholarships and scholarship loans are administered under the same regulations as scholarships and loans for undergraduates. Inquiries regarding them should be addressed to the dean of the Graduate School.

The William C. Gotshall Scholarships

A bequest from the late William C. Gotshall provides funds for six scholarships to be awarded annually to worthy graduate students in any branch of engineering offered at Lehigh University. Appointment is for one year, with an annual stipend of \$1000.00. Recipients of these awards pay the regular tuition fees. No duties other than graduate study are required of the holders.

Endowment of Scholarships

Undergraduate or graduate scholarships named to honor an individual or corporation may be established in perpetuity by arrangement with the board of trustees of Lehigh University. The income from this donation will be paid to the holder of the scholarship to be applied toward the payment of university fees. The University does not, however, guarantee that this income will be forever sufficient to pay such fees in full.

Research Fellowships

Graduates in appropriate curricula of colleges, universities, and technical schools whose requirements for graduation are substantially the same as those at Lehigh University are eligible to apply for appointment to any of the following research fellowships, as available, except the Student Chemistry Foundation Fellowship, which may be awarded only to a graduate of Lehigh University.

Appointment to these fellowships is for a period of two semesters and may be renewed, provided the work of the holder is of such quality as to justify the continuation of financial aid. Holders of the fellowships devote half their time to graduate study, and the other half to research work in the department to which they are assigned.

Graduate fellows pay the regular tuition fees. However, the Committee on Graduate Scholarships and Fellowships, in awarding a fellowship, may award at the same time a graduate tuition grant. The grant provides remission of all tuition fees during the period for which it is awarded.

A holder of a fellowship may not accept any employment for pay without the written permission of the dean of the Graduate School.

Candidates for fellowships must make application on blanks provided by the University on or before March 1. Requests for application blanks should be addressed to: Office of Admissions, Lehigh University, Bethlehem, Pa.

New Jersey Zinc Company Research Fellowship

The New Jersey Zinc Company provided funds in 1924 for a research fellowship to be known as the New Jersey Zinc Com-

pany Research Fellowship. Half of the time of the holder of this fellowship must be devoted to research work in the department to which he is assigned; the other half to graduate study leading to a master's degree.

The Henry Marison Byllesby Memorial Research Fellowships

In 1926 Mrs. H. M. Byllesby, widow of Col. H. M. Byllesby, M.E., '78, President of the Byllesby Engineering and Management Corporation, provided an endowment fund for the establishment of the Henry Marison Byllesby Memorial Research Fellowship in Engineering. Holders of these fellowships must devote half of their time to research work on some problem in electrical, mechanical, or hydraulic engineering, proposed by the president of the Byllesby Engineering and Management Corporation and approved by the Lehigh Institute of Research; the other half to graduate study leading to the degree of Master of Science. At the present time two awards can be made each year.

The James Ward Packard Research Fellowships in Electrical or Mechanical Engineering

The income from a bequest from James Ward Packard, M.E., '84, provides for a research fellowship in either electrical or mechanical engineering.

The C. Kemble Baldwin Research Fellowships in Aeronautics

A fund established by Mrs. C. Kemble Baldwin as a memorial to her husband, C. Kemble Baldwin, M.E., '95, provides for the appointment of a research fellow in any branch of science having a bearing on the field of aeronautics. One, or occasionally two appointments are available each year.

The Lawrence Calvin Brink Research Fellowship in Civil Engineering

A fund established by the late Mrs. L. C. Brink as a memorial to her husband, Lawrence Calvin Brink, C.E., '94, provides for the occasional appointment of a research fellow in civil engineering.

The Student Chemistry Foundation Fellowship

In the spring of 1927, members of the class of 1930 established the Student Chemistry Foundation in honor of Harry Maas Ullmann, A.B., Ph.D., a member of the chemistry department

from 1894 to 1938 and head of the department from 1912 until his retirement. Subsequent classes have contributed to this fund, which now provides an annual research fellowship in chemistry or chemical engineering. Only Lehigh graduates are eligible for this fellowship.

**The Garrett Linderman Hoppes Research Fellowship
in Civil Engineering**

A fund established by the late Mrs. Maria Hoppes in memory of her son, the late Garrett Linderman Hoppes, C.E., '83, provides for the occasional appointment of a research fellow in civil engineering.

The William L. Heim Research Fellowship in Chemistry

A research fellowship in chemistry was established by William L. Heim, B.S. in Chem., '02.

**The Roy R. Hornor Research Fellowship in Metallurgy
and Inorganic Chemistry**

The income from a bequest by Roy R. Hornor, B.S., '99, provides for a research fellowship in either metallurgy or inorganic chemistry. While the appointment generally will be made alternately between the metallurgy department and the chemistry department, it may be determined by the qualifications of available candidates.

The Katherine Comstock Thorne Fellowship in Biology

The late Gordon Comstock Thorne of the class of 1916 endowed, in memory of his mother, a fellowship in biology, to be known as the Katherine Comstock Thorne Fellowship.

Charles W. Parkhurst Research Fellowship

A fund established by Mrs. Mary Tudor Parkhurst to perpetuate the memory of her husband, a member of the Class of 1893. The income is used to provide a research fellowship in any field, as determined by the Board of Trustees.

Endowment of Fellowships

Research fellowships named in honor of an individual or a corporation, offering opportunities for graduate work and training in research in any designated field of study, may be established

in perpetuity through the payment to the board of trustees of at least \$30,000.00. The terms of the gift establishing a fellowship may provide for half-time service as a research assistant in the Lehigh Institute of Research, the remaining time to be devoted to graduate study. The income from this fund will be paid to the holder of the fellowship, after the deduction of his tuition and such charges as are necessary to cover the cost of materials, supplies, and apparatus required for the work of the fellow.

Prizes

Owing to the decreased return on invested funds, the income available for payment of prize awards may be insufficient to pay the amounts originally designated and planned by the donor. The University reserves the right to make such adjustments as may be necessary.

The Wilbur Scholarship Prize

The Wilbur Scholarship Prize, founded in 1872 by the late E. P. Wilbur, provides the sum of \$200.00 which is awarded annually to the sophomore with the best record for the sophomore year.

The John R. Wagner Award

The John R. Wagner Award was established by the widow of John R. Wagner, Lehigh, 1885, in memory of her husband. The sum of \$15.00 is awarded on Founder's Day each year to the junior student in mechanical engineering whose scholastic record is the highest in his class in the freshman and sophomore years and whose character and life purposes are deemed deserving and worthy.

The Wilbur Prizes

A fund was established by the late E. P. Wilbur for distribution in prizes as the faculty might determine. The income from this fund is used at present to provide awards as follows:

Wilbur Prizes, Freshman Year—a first prize of \$15.00 and a second prize of \$10.00 to the highest ranking and second highest ranking freshman in mathematics; prizes of \$15.00 each to the highest ranking freshman in English, German, and French.

Wilbur Prizes, Sophomore Year—prizes of \$10.00 to the highest ranking sophomores in mathematics, English, and physics.

The John B. Carson Prize

An annual prize of \$50.00 was established by Mrs. Helen Carson Turner, of Philadelphia, Pennsylvania, in memory of her father, John B. Carson, whose son, James D. Carson, was a graduate of the civil engineering curriculum of Lehigh University in 1876. It is awarded to that senior in civil engineering who shows the most marked excellence in the professional courses of his curriculum.

The William H. Chandler Prizes in Chemistry

Four annual prizes of \$25.00 each, one in each class, for excellence in the curricula in chemistry and chemical engineering, were established by Mrs. Mary E. Chandler, of Bethlehem, Pennsylvania, widow of Dr. William H. Chandler, who was professor of chemistry at Lehigh University from 1871 until his death in 1906. In memory of Dr. Chandler the faculty named the prizes the William H. Chandler Prizes in Chemistry.

The Electrical Engineering Prize

An annual prize of \$15.00, established by an anonymous graduate of the curriculum in electrical engineering, is awarded to the member of the sophomore class in electrical engineering having made the best record in the work of the sophomore year.

The Philip Francis duPont Memorial Prize in Electrical Engineering

The Philip F. duPont Memorial Prize Fund was established in 1929 by L. S. Horner, E.E. '98. The annual income of this fund is awarded each year in the way of prizes, two-thirds to the highest ranking senior and one-third to the second highest ranking senior in electrical engineering.

The Horn Prizes

The heirs of Harold J. Horn, E.E. '98, established a fund, the income of which is used in the award of a first and second prize of \$10.00 and \$5.00 respectively for the best work in the senior electrical engineering pro-seminar.

Alumni Prizes

Funds are provided by the Alumni Association for the annual award of four prizes of \$25.00 each. Two prizes are awarded to the highest ranking juniors in the College of Engineering, one to the highest ranking junior in the College of Arts and Science, and one to the highest ranking junior in the College of Business Administration.

The Williams Prizes in English

The late Professor Edward H. Williams, Jr., an alumnus of the University of the class of 1875, established prizes for excellence in English composition and public speaking. The freshman, sophomore, and junior prizes are awarded by the faculty on the recommendation of the department of English.

SOPHOMORE COMPOSITION PRIZES. A first prize of \$50.00, a second prize of \$25.00, and a third prize of \$15.00 are awarded annually for the three best compositions submitted by sophomores of regular standing as required work in their English courses.

JUNIOR COMPOSITION PRIZES. A first prize of \$50.00, a second prize of \$25.00, and a third prize of \$15.00 are awarded for the three best essays submitted by juniors as part of the required work in their courses in English.

The Williams Senior Prizes

The Williams Senior Prizes are awarded by the faculty on the recommendation of the committee on Williams Senior Prizes.

1. First prizes of \$100.00, second prizes of \$50.00, and third prizes of \$25.00 are awarded annually in each of the five fields of economics, English, philosophy, psychology, and history and government for dissertations submitted by regular members of the senior class on or before April 15.

2. The committee on Williams Senior Prizes publishes, before the close of the academic year, a list of recommended subjects for dissertations; but a senior may submit a dissertation upon any other subject in the respective field if the subject has received the approval of the committee.

3. Each senior entering the competition shall submit to the committee his choice of subject and plan of work by November 15.

4. The awards are made by the faculty upon recommendation of the committee, but no award is made if in any case a dissertation does not meet the standards of merit established by the committee. This standard includes such points as excellence in thought, plan, development, argument, and composition.

The Williams Prizes in Intramural Debating

Sums totalling \$200.00 are awarded annually as prizes in intramural debating. Students engaged in this activity are organized under the direction of the department of English into teams, which compete as units in a series of debates held throughout the year. The sum of \$120.00 is divided equally between the two members of the winning team, the sum of \$80.00 between the two members of the runner-up. Winners of first prizes may not compete in the next succeeding year.

The Williams Prizes in Extempore Speaking

A first prize of \$50.00 and a second prize of \$25.00 are awarded to freshmen of regular standing who excel in a contest in extempore speaking held in May of each year.

A first prize of \$75.00, a second prize of \$50.00, and a third prize of \$25.00 are awarded annually to the winners in a contest in extempore speaking for sophomores, juniors, and seniors. Winners of first prizes are not eligible to compete in subsequent years.

The Robert W. Blake Memorial Prizes

The Robert W. Blake Memorial Prizes are awarded at the Founder's Day exercises to freshmen enrolled in the program for general education. The prize committee (for the advisory council for general education) is composed of Professors Palmer and Diamond. The income from the Robert W. Blake Memorial Fund is devoted to the purchase of books awarded as prizes on conditions prescribed by the advisory council for general education.

The Goodman Prize in Fine Arts

An annual prize of \$25.00 has been provided by Mrs. David J. Goodman, to be awarded to a student enrolled in the department of fine arts. Any student is eligible for the prize who has

taken two semesters of work in the department of fine arts and has shown special ability in creative work or in critical appreciation in the field, as demonstrated by his classroom work and personal achievement. No student may be awarded the prize more than once.

The Irving Samuels Prize

An annual prize of \$25.00 has been provided by Abram Samuels III, B.S. in Bus. Adm. '42, in memory of his father, the late Irving Samuels, E.E. '13. This prize is awarded on Founder's Day to the highest-ranking freshman in the College of Business Administration.

The Allen S. Quier Prize in Metallurgy

An annual prize of \$15.00 has been provided by the daughters of the late Allen S. Quier in memory of their father, to be awarded to the senior who is adjudged by the staff of the department of metallurgical engineering to have made the most progress in his work in that curriculum. While high scholastic standing is a requisite, the prize is awarded on the basis of progressive achievement in scholastic work, rather than an average rating.

Scholarship Cups

PHI SIGMA KAPPA SCHOLARSHIP CUP. A scholarship cup, to be awarded for one year to the fraternity in the interfraternity council having the highest scholastic average for the preceding year and to become the permanent property of the fraternity winning it for three successive years, was provided by an alumnus of the Nu Chapter of Phi Sigma Kappa social fraternity in 1923. This cup was retired upon presentation to the Tau Delta Phi fraternity on Founder's Day, 1947, the winning group having had the highest scholastic average among those eligible for the prize for three successive years.

A new cup, to be known also as the Phi Sigma Kappa Scholarship Cup and to be awarded on the same terms as the original, has been provided by the local chapter of Phi Sigma Kappa.

TRUSTEES' SCHOLARSHIP CUP. The trustees of the University have provided a scholarship cup which is awarded for one year to the living group having the highest scholarship average for the

preceding year. The trustees' scholarship cup becomes the permanent property of any living group winning it for three successive years.

Prizes Awarded by Student Organizations

TAU BETA PI PRIZE. The Tau Beta Pi honorary engineering fraternity awards each year a slide rule or other prize of equivalent value to the engineering freshman having the highest scholastic average.

ETA SIGMA PHI PRIZE. The Eta Sigma Phi classical fraternity awards a cash prize of \$10.00 to that student doing the best work in sophomore collegiate Latin.

PI TAU SIGMA PRIZES. The Pi Tau Sigma honorary fraternity in mechanical and industrial engineering awards each year a mechanical engineers' handbook to the highest ranking freshman in the curricula in mechanical engineering and industrial engineering respectively.

ETA KAPPA NU PRIZE. The Eta Kappa Nu honorary fraternity in electrical engineering awards a handbook in electrical engineering to the highest ranking freshman in the curriculum in electrical engineering.

AMERICAN SOCIETY OF CIVIL ENGINEERS PRIZE. The Lehigh Valley Section of the American Society of Civil Engineers offers a prize of a junior membership in the American Society of Civil Engineers to the outstanding senior in civil engineering holding membership in the student chapter.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS JUNIOR MEMBERSHIP PRIZE. The Anthracite-Lehigh Valley Section of the American Society of Mechanical Engineers awards annually a prize of the value of \$10.00 to an outstanding member of the Lehigh Student Branch of the ASME. This prize takes the form of junior membership for one year in the parent society.

AMERICAN CHEMICAL SOCIETY AWARD. The Lehigh Valley Section of the American Chemical Society awards a membership in the American Chemical Society and a subscription to a journal

of this society to the highest ranking junior in chemistry or chemical engineering.

ALPHA A. DIEFENDERFER AWARD. In recognition of Professor Emeritus Alpha Albert Diefenderfer's long service as faculty adviser to the organization, the Lehigh University Chemical Society established in 1947 the Alpha A. Diefenderfer Award for the highest ranking sophomore in analytical chemistry. Each winner is presented with an engraved certificate, and his name is inscribed on a plaque given by the Society and displayed in the Chemistry Building.

ALPHA KAPPA PSI KEY. The Alpha Sigma Chapter of Alpha Kappa Psi, a professional fraternity in commerce, awards annually the Alpha Kappa Psi Scholarship Key to the senior student pursuing a degree in the College of Business Administration, who has attained the highest scholastic average for three years of collegiate work at Lehigh University.

Summer Sessions

The courses offered during the 1950 Summer Session were arranged in three groups: (1) the regular session of six weeks, June 27 through August 9, designed for graduate students, teachers, and adults interested in special college work and for undergraduates; (2) the post-session, August 10 through August 27, designed primarily for graduate students; (3) the workshops, June 27 through July 16 and July 30, consisting of programs in the fields of health education and curriculum development exclusively for teachers. All Summer Session courses are open to both men and women.

The *Summer Session Announcement*, containing a full description of courses to be offered in 1951 together with information concerning admissions, fees, etc., will be sent on request addressed to the director of the Summer Session. The following courses were offered in the Summer of 1950.

SUMMER SESSION COURSES

Regular Summer Session*

June 26 through August 9, 1950

Educ. 321	Diagnosis & Adjustment of Reading Difficulties	(3)
Educ. 351	Organization of Materials of Instruction	(3)
Educ. 390	Visual Instruction	(3)
Educ. 422	Education of Exceptional Children	(3)
Educ. 444	Elementary School Curriculum	(3)
Educ. 453	Secondary School Administration	(3)
Educ. 458	Extra-Curricular Activities	(3)
Educ. 463	Public School Administration	(3)
Educ. 466	Supervision of Instruction	(3)
Educ. 468	Vocational Education	(3)
Educ. 483	Techniques of Counseling	(3)
Educ. 491	Seminar, Educational Sociology	(3)
Educ. 493	Individual Research	(3)
Educ. 496	Seminar, Personnel Problems	(3)
Engl. 325	English Literature of the Romantic Era	(3)
Engl. 420	Graduate Seminar	(3)
Engl. 432	Graduate Thesis	(3)
Speech 251	Radio Workshop	(3)
Speech 260	Speech for the Teacher	(3)
Journ. 201	Modern Newspaper Practice	(3)
Hist. 251	A Pro-Seminar in United States and Pennsylvania History for Teachers	(3)
Hist. 423	American Constitutional History	(3)
Math. 418	Theory of Elasticity	(3)
Math. 431	Calculus of Variations	(3)

POST-SESSION

August 10 through August 26, 1950

Educ. 447F	Current Probs. in Ele. Sch. Subj.—Arts and Crafts	(3)
Educ. 454	Secondary School Curriculum	(3)
Educ. 482	Educational & Vocational Guidance	(3)
Educ. 495	Seminar, Business Management	(3)

WORKSHOPS

June 26 through July 28

Educ. 391	Workshop: Curriculum Revision in the Elementary School	(3, 5, 6)
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June 26 through July 14

Educ. 392	Workshop: Health Education in the Elementary School	(3)
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*Graduate and Adult Education students.

General College Division

The General College Division, plans for which were approved by the faculty on April 6, 1942, was organized to supplement the work of the established undergraduate curricula by meeting the educational needs of certain special groups of students. The Division aims to provide an opportunity for young men not planning a four year program to pursue such work, either of a general or a more specialized nature, as their preparation and interests make desirable; a trial period for those who wish to become candidates for baccalaureate degrees but whose preparatory training does not fully satisfy the entrance requirements for the curricula of their choice; and facilities for qualified male adults to continue their education without being committed to a restricted or specialized program.

Although all work available through the General College Division will be found at present among the regular offerings of the several departments, the work taken by students enrolled in this division is not regarded as primarily preparation for admission to the upper classes of the University; rather, the courses are looked upon as complete in themselves. As time indicates certain needs not recognized at the moment, consideration will be given to the development of special courses for the General College Division group.

Each student in the General College Division has an individual program, one not subject to distribution or curriculum requirements, yet one limited by the student's ability to meet the prerequisites of the courses which he desires to take. With but few exceptions, the student enrolled in this division enjoys the same privileges as all other undergraduates in the University, including eligibility to unrestricted prizes, access to student aid, and the right of petition; and he is also subject to the same general regulations, those pertaining to scholastic probation not excepted. The General College Division student will not, however, be a candidate for a degree, save in those instances where transfer to one of the undergraduate programs of study leading to degrees is approved by a committee composed of directors of curricula.

Adult Education Program

The Adult Education Program is committed to serving the needs and interests of people in all walks of life. It is limited to courses offered in the afternoon, evening, and Saturday sessions, but is open alike to men and women students of twenty-one years of age and older.

A wide variety of courses is included in the present program. Some are intended to meet specific needs of special groups. Others attempt to serve the general public in such fields as art, literature, history, government, and international relations. Still others result from cooperative arrangements with business and industry, and with service and welfare agencies.

The Adult Education Program, approved by the faculty on March 6, 1944, is a recognition of the principle that social institutions have service responsibilities within their spheres of influence. As a private educational institution, Lehigh University's interest is as great but its area of operation properly more restricted than that of a publicly supported institution of higher learning. It is the desire of the University to meet the increasing demand for this new service through a flexible program closely adjusted to individual needs and interests.

Program in General Education

A program in general education, inaugurated in 1936, provides an opportunity for those students who desire to read either for the purpose of broadening their range of intellectual interests or to pursue some special line of reading not available in regular classroom instruction. Students participating in this program are afforded an opportunity to discuss not only their reading but also their intellectual problems in general with a faculty adviser with whom they come to feel a personal relationship. The independent pursuit of knowledge and the intellectual self-development of the student comprise the aim of the program.

The advisory council for general education, consisting of a group of faculty members with special aptitude for this work, is in charge of the program in general education. Each year the council formally invites the members of the freshman class to

apply for enrollment in the program, but any student in the University may at any time apply to the chairman of the council for admission. No credit toward a degree is allowed for this work, and there are no regular hours or assignments. The conduct of the work is left entirely to the student and his faculty adviser. Only those students, however, who appear able to profit by the program are admitted.

There is no fee in connection with the work of the program in general education.

University Library

The overall pattern of library service at Lehigh conforms with that in most libraries: the foundation is a sound collection; the aim is utility.

Collections

The collections, of which there are four, number in all about 310,000 volumes, with annual accessions at the rate of 4,000. The Dewey Decimal system of classification has been employed universally. The General Collection constitutes the main body of the Library. It is strong in many fields, notably Geology, Metallurgy, Chemistry, Physics, History and Literature. The Library currently receives some 1400 serials and periodicals, and has long been a depository for a wide selection of U. S. Government documents. All students have access to the General Collection.

Reference Collection

The Reference Collection, shelved in the Reading Room for maximum availability, embodies all the basic indexes, dictionaries and encyclopedias necessary for undergraduate and graduate study. The Library maintains one permanent newspaper file, *The New York Times*, currently received on microfilm. For obvious reasons the Reference Collection does not circulate.

Rare Book Collection

The Rare Book Collection of over 6,000 volumes, includes the foundation stones in several important branches of knowledge: in Ornithology, both Audubon's *Birds of America*, and the Gould folios; in Voyages and Travels, both Hakluyt's *Principal Navigations* and De Bry's *Voyages*; the four folios of Shakespeare;

and a fine group of Restoration Dramas. The present policy encourages use of these especially valuable volumes, although circulation is strictly controlled.

Lehigh Collection

The Lehigh Collection is maintained to assure permanent preservation of the University archives. It contains all official publications of the University as well as the writings of Lehigh faculty, students, and alumni. All theses and dissertations required for advanced degrees are kept as part of the Lehigh Collection. Under certain circumstances these volumes may be withdrawn for outside use.

The effectiveness of the Library depends upon getting books and students together. It is for this reason that the Lehigh Library employs the open-stack system. Beyond this measure, each Freshman receives a three-hour orientation course in the use of the Library as part of the requirement in the Department of English. A copy of the *Library Handbook*, the guide to efficient use of bibliographical tools, may be had at the Loan Desk. Reference service is available to all who use the Library. Finally, for the graduate student, books and documents not held by Lehigh may be secured from other libraries on the Interlibrary Loan system in operation throughout this country and Canada.

Art Gallery

In the Lehigh Art Gallery, located on the third floor of the University Library, there are held frequent exhibitions of paintings, watercolors, drawings, sculpture, photographs, or prints, chiefly by contemporary American and foreign artists. The University owns a small collection of prints and paintings, largely gifts of alumni and friends, which are also exhibited from time to time. The offerings of the Art Gallery constitute a definite part of the University's educational and cultural program. While intended primarily for the interest of students, the exhibitions are open to the public.

Religious Observances

On each Sunday of the academic year chapel services are held at 11:00 A.M. in Packer Memorial Church, with the chaplain of the University in charge. Outstanding leaders of the Christian

Church fill the pulpit approximately once a month. Holy Communion services are held every Sunday at 10:00 A.M.

There are also a number of special religious observances, such as the Chapel Service and Convocation which opens Freshmen Week, the All-University Chapel Service and Convocation, which marks the official opening of the academic year; the annual Christmas Vesper Choral Program; the observance of the World Student Christian Federation Day of Prayer with other schools in the area; the presentation by the Chapel Choir of a Cantata during Lent; and the annual All-University Memorial Observance in May.

Attendance at all religious services is voluntary.

Students' Health Service

The Students' Health Service is located at the east end of Memorial Drive, opposite Taylor Gymnasium, and consists of an ambulatory Dispensary. We have no Infirmary. Office hours are from 8:30 A.M. to 6:00 P.M. daily except Saturdays and Sundays. Saturday hours are from 8:30 A.M. to 12:30 P.M., and Sunday from 10:00 A.M. to 12:00 noon. Through the Summer semester no Sunday hours are held. Within these hours the Health Service Staff is available for consultation and treatment.

In the event of injury or illness outside regular Dispensary hours, the services of a local physician should be obtained. Such physicians' fees will be paid by the student or his family, and not by the Health Service. Any physician of choice may be consulted. However, a list of physicians' names and phone numbers is distributed each Fall at the beginning of the College year for posting in each living group for students' convenience. Due to limited Staff and a multiplicity of Dispensary duties, Health Service physicians are not able to make professional calls on students in living groups, or in rooms. If unable to visit the Dispensary, students are advised to call in a local physician for necessary treatment. Again, such physicians' fees will be paid by the student or his family.

Ambulatory Dispensary Services

Medical and minor surgical problems of students are handled by the Dispensary. A necessarily limited courtesy service is also

extended by the Health Service to those faculty members and other employees who wish to avail themselves of it.

Certain Laboratory facilities, including B.M.R., and limited allergy tests are important adjuncts to the Dispensary.

A complete Physiotherapy room is also a valuable part of any University Health set-up and Lehigh's is exceptionally well-equipped in this regard.

Physical Examinations

Physical examinations for new and transfer students are given just before the start of the Fall and Spring Semesters. Special physical examinations for Advanced R.O.T.C applicants are also given during the first or second week of college.

All new employees must have a physical examination before beginning their duties at the University. Such pre-employment examinations will be done by the Health Service free of charge. However, if preferred, the examination may be completed by the applicant's own physician on Health Service Forms and will be paid for by the applicant. The completed report should then be mailed directly to the Director of the Health Service for confidential analysis and filing.

The Physicians of the Health Service carefully analyze the results of all physical examinations in order to detect any latent or obvious physical, emotional, or mental disability. When found, the person involved may be invited in for a conference, and his disability discussed with him confidentially.

Close cooperation between the Department of Physical Education and the Health Service permits the establishment of rehabilitation measures, etc., as indicated, for students. All students are graded for the Physical Education program according to their respective abilities to participate in all kinds of physical activities.

Furthermore, students who are unable to meet the physical requirements for participation in the R.O.T.C. program are disqualified from that Unit by the Health Service.

Tuberculosis Survey

A 70 mm Photocron Chest Xray is made of each incoming student, faculty member and other employee routinely. Any

departure from the normal noted during the reading of these films calls for a 14" x 17" chest Xray and further investigation.

Immunizations

In line with University regulations, all new and transfer students are required either to show evidence of recent vaccination against smallpox, or to submit to such vaccination at the time of physical examination.

In addition, protection against triple typhoid, tetanus, influenza A & B, and various allergies are offered when and as indicated, the last two at the students' expense.

Neuropsychiatric Services

In all College Health Services today this is an important and busy one. It offers needed assistance to students who have personal and confidential problems that interfere to a greater or lesser degree with their school work. Emotional conflicts, neuroses, anxiety states, etc., complicated by difficult curricula frequently spell educational disaster to many, who, by virtue of an early unsatisfactory personal background or adjustment, are unable to cope with their problems.

The Health Service is a part of the University's new Student Counseling Service. Its contribution to this Service consists of establishing insofar as possible the mental, emotional and physical status of any referred student's health situation. It is a fine Service in its entirety and has already proven of great value to many students.

Engineering Camp

The Engineering Camp is held annually for a 4-6 weeks period during the summer. The Assistant Director of the Health Service usually is the Physician of the Camp.

Instruction in Health

Lectures in Freshman Hygiene are given to non-veteran freshmen. Such lectures are all-inclusive, and are aimed at preparing new men for whatever health hazards they may meet within their new environment.

Xray Services

The present Xray equipment of the Health Service includes a regulation Xray unit, a Bucky table, a 70 mm Photocron Chest Xray unit, and all the necessary developing and drying apparatus. Our Xray services are limited to bone and chest films. We do not Xray any body organs which involve the use of dyes, barium; etc., for their discovery.

To others than students, a small charge is made to cover the cost of materials used.

Personnel

Full-time Health Service personnel normally includes 3 physicians: the Director, the Assistant Director, and the intercollegiate teams' Surgeon; a Physiotherapist, a Laboratory and Xray Technician, 2 Nurses, a Secretary, and a Recorder. Part-time personnel includes an Assistant Physician and a First-aid Technician.

Health and Accident Insurance

The University offers students a choice between two kinds of insurance policies against illness and/or injury. One kind of policy covers for both illness and accident, and the other for accident only. The latter policy, of course, costs less. Both kinds are offered for a very nominal fee, and on an entirely voluntary basis.

The Health Service recommends highly these insurance plans to both present and prospective students. Much experience has emphasized the importance of such protection, and we urge all students to participate in one or the other of these plans throughout their entire college careers.

Placement, Counseling and Testing Service

In order to prepare the student for the exigencies of college life, the university maintains a placement, counseling and testing service. This service functions to help the student make satisfactory adjustments to his college environment, to help improve reading and study habits, and to provide occupational counseling and aid in obtaining a job while in school or upon graduation.

Counseling and Testing Services

The primary aim of counseling is to aid the student in gaining a better understanding of himself so that he may have a basis for more satisfactory adjustments.

Many normal individuals fail to achieve genuine satisfaction and true success because they are blocked by lack of knowledge of their abilities and aptitudes, inadequate vocational information or inability to make personal and social adjustments.

There are available a well-developed library of occupational and educational materials and a variety of interest, achievement, personality, aptitude, and ability tests for the use of the student in self-appraisal. Counselors confer with those seeking guidance, interpreting test results and helping the counselee to analyze his capacities so he can better make his own decisions as to his future course of action. Every student in the University is privileged to avail himself of this counseling service without cost.

Another service is the administration of many group testing programs throughout the year. In addition to the Freshman Week testing program there are offered the Graduate Record Examination, Law School Admissions Test, Medical College Admissions Test, National Teacher Examinations, Pre-Engineering Inventory, Accounting Orientation Test and others.

Counseling and testing services are also available to the children and adults of the surrounding communities. Test scoring with an electric scoring machine and a statistical service serve both the University and neighboring public schools and colleges. One of the important functions of the Service is the undertaking of research and study dealing with tests, counseling, and other personnel problems.

Reading and Study Clinic

"How can I improve my reading and study habits?" The response to this query has prompted many students to seek help in making the best use of their potentialities. It has also prompted the growth of this important University service to assist students in making more effective personal adjustments through the development of adequate learning skills.

The Clinic has three functions: first, to ferret out the difficulties which may impede the individual's scholastic progress; second, to counsel students who are desirous of making more effective adjustments; third, to provide a systematic supervised improvement program.

A reading analysis may assist the student in finding his present reading level and in noting the areas in which improvement would be desirable. It gives the individual an opportunity to examine his learning skills and the factors which affect them. This service is also made available to the community.

Individual consultations may lead to an understanding of the implications of the test results as well as to a program for self improvement. It also gives the student an opportunity to take account of himself in a manner not provided by tests.

A supervised improvement program, with students organized in small groups, makes use of a large variety of equipment and exercises. This program is entirely voluntary and those who are interested are invited to participate.

The Clinic does not offer a panacea for all difficulties. It does, however, provide students with an opportunity to develop more effective skills with which to demonstrate their intellectual capacities.

Placement Service

Occupational counseling is available to all students and alumni through the placement service, which aids in giving the individual a wider picture of his capabilities and interests and helps direct him toward a job.

Assistance is given to: seniors seeking positions, students seeking part time work or full time summer employment, students seeking employment on their own, and alumni seeking employment or a change of employment.

SENIOR PLACEMENT. During the college year, the representatives of many large concerns come to the campus to recruit personnel for the industry or business houses which they represent. The placement service arranges interviews with seniors and the representatives of the various concerns. As a result, many of the students interviewed secure positions which they assume after graduation.

Interviews are also arranged for seniors at the offices of companies which do not send representatives to the campus.

STUDENT SERVICES. The placement service endeavors to place students in full time summer employment of a general nature or in the fields for which they are preparing in college.

In cooperation with the faculty and local merchants, the placement service endeavors to secure part time work for students who are in need of financial assistance in order to continue in college. Students cannot expect to earn enough money to cover all incidental expenses. A modest, but not extensive, work program is possible for students with the determination, mental capacity, and physical vigor to overcome the hardships coincident to such a program.

ALUMNI PLACEMENT. Any alumnus seeking employment or a change of employment may register with the placement service at no charge. He will be referred to various positions as they become available.

Academic Observances

Midyear Commencement 1950

Commencement exercises for the Class of February 1950 were held Sunday afternoon, February 5, 1950 in Eugene Gifford Grace Hall. Degrees were conferred and graduation honors were announced. The address to the members of the graduating class was delivered by Oliver Cromwell Carmichael, A.B., A.M., B.Sc., LL.D., Litt.D., D.C.L., H.H.D., President, Carnegie Foundation for the Advancement of Teaching.

Baccalaureate Sunday

Baccalaureate services were held on Sunday afternoon, June 18, 1950 in Eugene Gifford Grace Hall, with the Reverend George Martin Bean, University Chaplain, in charge. The sermon was delivered by Rt. Rev. Richard S. Emrich, Ph.D., S.T.D., LL.D., Bishop of the Diocese of Michigan, Detroit, Michigan.

University Day

University Day was observed Monday, June 19, 1950. Commencement exercises, which began at 10:30 A.M., were held in Eugene Gifford Grace Hall. The address to the graduating class was delivered by Erwin Dain Canham, B.A., M.A. (Oxon.), Litt.D., Editor, Christian Science Monitor. Honorary degrees and degrees in course were conferred, commissions in the Officers' Reserve Corps were awarded, and graduation honors and prizes won by members of the graduating class were announced.

Founder's Day

The annual exercises in honor of the founder of the University were held Sunday afternoon, October 8, 1950 in the Packer Memorial Church. The address was delivered by Raymond Walters, B.A., M.A., LL.D., Litt.D., President, University of Cincinnati. Degrees were conferred; and graduation honors, class honors, and prizes were announced.

Alumni Association

The Alumni Association, which has been in existence since 1876, was incorporated in 1917 under the name of the Alumni Association of the Lehigh University, Inc. The offices of the association are in the Alumni Memorial Building. Along with the regular alumni activities, the association is largely concerned with raising money to meet the needs of the University.

The officers of the Alumni Association for 1950-51 are:

President, Edward A. Curtis, '25, Washington Crossing, Pa.

Vice-President, George F. A. Stutz, Jr., '22, Palmerton, Pa.

Vice-President, H. Randolph Maddox, '21, Washington, D. C.

Treasurer, H. P. McFadden, '25, Bethlehem, Pa.

Archivist, Arthur W. Klein, '99, Bethlehem, Pa.

Executive Secretary and Editor of the *Lehigh Alumni Bulletin*,
Leonard H. Schick, '37, Bethlehem, Pa.

The following are the alumni clubs: New York Lehigh Club, Philadelphia Lehigh Club, Pittsburgh Lehigh Club, Chicago Lehigh Club, Washington, D. C. Lehigh Club, Detroit Lehigh Club, Northeastern Pennsylvania Lehigh Club (Scranton and

Wilkes-Barre, Pa.), Maryland Lehigh Club (Baltimore, Md.), Youngstown (Ohio) Lehigh Club, Lehigh Club of New England (Boston, Mass.), Lehigh Club of Central Pennsylvania (Harrisburg, Pa.), Lehigh Club of Northern New York (Schenectady, N. Y.), Lehigh Club of Central New York (Rome, N. Y.), Lehigh Club of Northern Ohio (Cleveland, Ohio), Lehigh Club of Southern New England (Hartford, Conn.), Lehigh Club of Western New York (Buffalo, N. Y.), Lehigh Home Club (Bethlehem, Pa.), Lehigh Club of Southeastern Pennsylvania (Reading, Pa.), Lehigh Club of Central Jersey (Trenton, N. J.), Lehigh Club of York-Lancaster (Pa.), Lehigh Club of Northern New Jersey (Newark), Lehigh Club of Northern California (San Francisco), Lehigh Club of Southern California (Los Angeles), Lehigh Club of Delaware (Wilmington), Lehigh Club of Monmouth County, N. J., South Jersey Lehigh Club (Camden).

ORGANIZATIONS

Honorary Scholarship Societies

PHI BETA KAPPA. Students in the College of Arts and Science and the College of Business Administration who, up to the middle of the senior year, maintain high scholarship may be elected to membership; also a limited number of engineering students whose work in philosophical, scientific, and language studies is of high grade.

TAU BETA PI. This national honorary society, which now has seventy-one chapters, was founded at Lehigh University in 1885 by Professor E. H. Williams, Jr. Students in the College of Engineering may be elected to membership during their junior and senior years if they have maintained high scholarship.

SIGMA XI. Election to membership is based upon the completion of original and noteworthy research in pure or applied science and the publication of the results thereof. Ordinarily undergraduates are eligible to associate membership only, their election being based upon their promise of achievements in scientific research.

Other Honorary Scholarship Societies

ALPHA EPSILON DELTA (pre-medical)
BETA GAMMA SIGMA (business administration)
ETA KAPPA NU (electrical engineering)
ETA SIGMA PHI (classics)
PHI ALPHA THETA (history)
PHI ETA SIGMA (freshman)
PI GAMMA MU (social science)
PI MU EPSILON (mathematics)
PI TAU SIGMA (mechanical engineering)

Course Societies

Intellectual interest in various fields of study and professional spirit among arts, business, and engineering students is promoted by a group of organizations commonly called course societies. The first of these organizations historically was the Chemical Society, established in 1871. The list now includes:

In Arts and Science

Circulo de Español
Delta Omicron Theta (debating)
Der deutsche Verein
International Relations Club
Horace Mann Educational Society
Newtonian Society (mathematics)
Psychology Club
Robert W. Blake Society (philosophy)
Robert W. Hall Pre-Medical Society

In Business Administration

Alpha Kappa Psi (professional fraternity in business administration)
Lambda Mu Sigma (marketing)
Lehigh Business Society

In Engineering

American Chemical Society (chapter of student affiliates)
American Institute of Chemical Engineers (student chapter)
American Institute of Industrial Engineers (student branch)
American Society of Civil Engineers (student branch)
Howard Eckfeldt Society (student branch of the American Institute of Mining and Metallurgical Engineers)

Electrical Engineering Society (student branches of the American Institute of Electrical Engineers and Institute of Radio Engineers)
 Mechanical Engineering Society (student branch of the American Society of Mechanical Engineers)
 Metallurgical Society
 Physics Society
 Student Chemical Society

Other Student Organizations

Alpha Chi Epsilon (Episcopal pre-theological honorary society)
 Alpha Lambda Omega (Allentown group)
 Alpha Phi Omega (national service scouting fraternity)
 American Ordnance Association (Lehigh Post)
 Arcadia, the Student Council
 Arnold Air Society
 Bridge Club
 Brown Key Society
 Camera Club
 Canterbury Club
 Chapel Choir
 Chess Club
 Chinese Students Club
 Christian Council
 Combined Musical Clubs (Glee Club, dance orchestra, symphony orchestra)
 Cosmopolitan Club
 Cut and Thrust Society (fencing)
 Cyanide Club (junior honorary society)
 DeMolay Club
 Ernest W. Brown Astronomical Society
 Flying Club
 Golf Club
 Hillel Society
 Interdormitory Council
 Interfraternity Council
 Lehigh Christian Fellowship
 Lehigh Music Festival Organization
 Lehigh University Band

Motor Club
Mustard and Cheese (dramatic club)
National Society of Pershing Rifles
Newman Club
Omicron Delta Kappa (senior honorary fraternity)
Pi Delta Epsilon (honorary journalistic fraternity)
Political Science Assembly
Radio Club
Roger Williams Fellowship
Sailing Club
Scabbard and Blade (honorary military fraternity)
Ski Club
Society of American Military Engineers
Sportsmen's Club
Town Council
Varsity "L" Club
WLRN (Radio Brown and White)

The following Greek letter fraternities have chapters at Lehigh University: Alpha Chi Rho, Alpha Sigma Phi, Alpha Tau Omega, Beta Theta Pi, Chi Phi, Chi Psi, Delta Phi, Delta Sigma Phi, Delta Tau Delta, Delta Upsilon, Kappa Alpha, Kappa Sigma, Lambda Chi Alpha, Phi Delta Theta, Phi Gamma Delta, Phi Sigma Kappa, Pi Kappa Alpha, Pi Lambda Phi, Psi Upsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi, Sigma Phi Epsilon, Tau Delta Phi, Theta Chi, Theta Delta Chi, Theta Kappa Phi, Theta Xi.

Student Publications

The students of Lehigh University publish a semi-weekly college newspaper, *The Lehigh Brown and White* and a year book, *The Epitome*.

Lehigh Institute of Research

The Lehigh Institute of Research was organized in 1924 to encourage and promote scientific research and scholarly achievement in every division of learning represented in the organization of the University, and in recognition of the need for further and more exact knowledge in science and in the application of science

to the affairs of modern life. The institute was reorganized in 1945 in order to cooperate more effectively with industry and government agencies.

The purposes of the Institute of Research include the training of men for research work, the publication of results of investigations, the conduct of general research, the conduct of cooperative research, and advisory service.

Detailed information concerning the organization and regulations of the Institute of Research will be provided by the Director upon request.

INDUSTRIAL RESEARCH APPOINTMENTS

Lehigh University cooperates with industrial concerns, technical associations and government agencies in carrying on basic and applied research designed to develop new and improve old products and methods of production. In connection with cooperative research projects, there are usually available every year for qualified graduate students a number of research assistantships. Appointments are for one year, subject to extension or renewal. All industrial research is under the direction of the Lehigh Institute of Research. Applications for appointments as research assistants, accompanied by evidence of the candidate's qualifications for the appointment sought, should be sent to the Director of the Lehigh Institute of Research.

Among the cooperative research programs in progress at present are those sponsored by the following agencies:

Various Departments of the United States
Government, Army, and Navy
The American Electroplaters Society
The American Cyanamid and Chemical
Company
The Mutual Chemical Company of America
The Martin Dennis Company
The Prior Chemical Corporation
The Armstrong Cork Company
The Bethlehem Steel Company
The Catalin Corporation of America
The William S. Merrell Company

The National Lead Company
The Westvaco Chlorine Products Division
Kentile, Incorporated
The Seton Leather Company
The S. B. Foot Tanning Company
The Pfister and Vogel Tanning Company
The George D. McLaughlin Memorial
Foundation
The Nopco Chemical Company
The Philadelphia Paint and Varnish
Production Club
Roberts and Schaefer Company
The Heat Exchange Institute
The Paschall Oxygen Company
The National Printing Ink Research Institute
The American Institute of Steel Construction
The Association of Iron and Steel Engineers
The Socony-Vacuum Oil Company
The Pressure Vessel Research Committee
The Welding Research Council
The Pennsylvania Manufacturing
Confectioners Association
Harshaw Chemical Company
Advance Solvents and Chemical Corporation
General Mills, Incorporated
Althouse Chemical Company
Fels and Company
Vale Chemical Company
Pennsylvania Department of Highways

Buildings and Grounds

The University occupies twenty-six buildings which are located on a tract of land covering one hundred eighty acres on the north side of South Mountain, overlooking the valley of the Lehigh River and the City of Bethlehem. In addition, the University has an athletic field, seven and one-half acres in area, with field house, gymnasium, and covered grandstand, located about a mile from the University campus.

Packer Hall

Packer Hall is a four-story sandstone building, 215 feet long and 60 feet wide.

The department of civil engineering occupies the greater part of the first and second floors. The drawing rooms, surveying instrument room, structural models and soils mechanics laboratories are located here, the balance of the laboratories being in Fritz Engineering Laboratory.

The departments of mathematics and astronomy, philosophy and psychology also are located in this building. The psychology laboratory has the standard equipment for the several courses in experimental psychology and for research

Packer Hall Addition

Known as the J. L. Pratt Research Laboratory. A one story concrete block building, 22 feet wide and 33 feet long, located on the south center part of the main building.

The Chemistry Building

The Chemistry Building is a three-story fire-proof sandstone edifice, 259 feet long and 44 feet wide, with a wing 62 feet long and 42 feet wide, and with a three-story extension, 60 feet long and 37 feet wide. An additional three-story wing, 116 feet long by 52 feet wide, has been added to the east of the original building.

Laboratory space and equipment are provided for qualitative and quantitative analysis, inorganic chemistry, organic chemistry, sanitary chemistry, industrial biochemistry, colloid chemistry, X-ray analysis, gas analysis, the furnace assay of ores, industrial chemistry, chemical engineering, and research in chemistry and chemical engineering.

The trustees of the University named this building, exclusive of the new east wing, the William H. Chandler Chemistry Laboratory in recognition of Dr. Chandler's thirty-five years' service as professor of chemistry, 1871-1906. The east wing was named the Harry M. Ullmann Chemistry Laboratory, in recognition of Dr. Ullmann's service as head of the chemistry department.

The Physics Building

The Physics Building is a four-story sandstone structure, 240 feet long and 44 to 56 feet wide. This building is devoted entirely to the department of physics. In addition to offices, recitation rooms, and lecture rooms, there are fully equipped laboratory rooms for undergraduate and graduate classes, a number of smaller laboratories for research, a reading room, machine shop, wood-working shop, glass-blowing room, constant-temperature rooms, storage battery room, sound-proof room, and dark rooms. The building is equipped throughout with water, gas, compressed air, and electric power outlets.

The W. A. Wilbur Engineering Laboratory and Power House

The W. A. Wilbur Engineering Laboratory and Power House is a two-story sandstone building, 188 feet long and 44 feet wide.

The power plant contains four Babcock and Wilcox straight-tube cross-drum boilers, each rated at 300 boiler horse-power, four Coxe chain grate stokers, two turbine-driven Sturtevant blowers, and coal-, water-, and ash-handling equipment of modern design.

The plant is designed and equipped to provide steam at 250 pounds pressure to the engineering laboratories, in addition to heating the University buildings. It is so arranged that any boiler can be isolated for laboratory tests for long periods if necessary. From this plant a six-inch line carries steam to the Packard Laboratory at the pressure desired for the laboratory work. Modern safety appliances and measuring equipment have been incorporated.

A coal-storage yard has room for two months' supply of coal, and a system of belt-conveyors and bucket-elevators is provided for receiving coal, dumping it on the storage pile, and conveying it into the boiler room as needed.

Williams Hall

Williams Hall, the donation of Dr. Edward H. Williams, Jr. of the class of 1875, was so named by the trustees of the University in recognition not only of this gift but also of Dr. Williams' long continued and important service to the University as professor of mining and geology.

Williams Hall is a three-story brick building, 186 feet long and 70 feet wide. It contains the offices, class rooms, laboratories, departmental libraries, and museum collections of the departments of biology, geology, and metallurgical engineering.

Vivarium

The Vivarium is a three-story concrete and brick surface building 35 feet long and 25 feet wide, with a green house on the upper floor. A bridge passage connects the third floor of the Vivarium with the second floor of Williams Hall.

The Fritz Engineering Laboratory

The late John Fritz, of Bethlehem, known as the father of the steel industry in the United States, a member of the University's original board of trustees, gave to the University funds for the erection and thorough equipment of an engineering laboratory. The building, which was designed and erected under the personal supervision of Mr. Fritz, is used by the department of civil engineering and mechanics for various research products and for laboratory work in connection with instruction in the mechanics of materials, hydraulics, and properties of cement and concrete.

The structures and materials section provides one of the outstanding laboratories of the country. Located in the main central bay, about 62 feet by 43 feet in plan, it is serviced by a ten-ton overhead crane and has a variety of universal testing machines, ranging in capacities from 20,000 to 800,000 pounds, including several of the most recent design. A special laboratory is maintained for undergraduate instruction in materials testing. Machines for torsion, repeated stress, impact, bend, and hardness tests are also available. The laboratory has strain- and deformation-measuring apparatus of all types.

The hydraulics laboratory has two levels, each 36 feet by 49 feet in plan. On the lower level are pumps, tanks, turbines, weirs, and appropriate apparatus used both for student instruction and industrial tests. Separate tanks and a circulating system with appropriate meters are available for oil flow studies. The upper level, except where cut through by high-pressure constant-head storage tanks, is largely available for special large size spillway or river model tests.

The laboratory machine shop is completely equipped with lathes, millers, drill-presses, grinders, power saws, and miscellaneous tools and equipment. The welding shop provides both electric arc and resistance welding.

The laboratory for making and storing plain and reinforced concrete test specimens is 36 feet by 29 feet in plan and includes storage bins for aggregate, together with equipment for making and storing all types of plain and reinforced concrete specimens.

Other facilities include photoelastic stress analysis equipment, a metallographic laboratory, offices for the staff, a photographic dark room, and a conference room.

The Eckley B. Coxe Mining Laboratory

The Eckley B. Coxe Mining Laboratory is a two-story sandstone building, 100 feet long and 75 feet wide. It is occupied exclusively by the department of mining engineering.

The building contains the offices of the department of mining engineering, a recitation room, a drafting room, a locker and wash room, a laboratory equipped for fuel research, a balance room, and a shop.

On the lower main floor are two air compressors, rock drills, and a motor-generator set. The upper main floor has one section for crushing, grinding, and the preparation of samples, and for making sieving tests. The remainder of this floor is equipped with units for elementary and advanced laboratory work in ore dressing and coal preparation—ball mills, a rod mill, classifiers, jigs, concentrating tables, flotation machines, magnetic separators, and a Chance coal cleaner, together with auxiliary equipment such as float-and-sink apparatus, ore-dressing microscope, etc.

The lower second floor is equipped as a laboratory for the necessary analytical work in connection with ore dressing and coal preparation, and as a fuel technology laboratory for coal, gas and oil analysis. Part of the upper second floor is used as a departmental drafting room in connection with the courses in mine surveying and mining methods; the remaining portion is being equipped as a mine ventilation laboratory.

The laboratory was named by the trustees of the University in memory of Eckley B. Coxe, who was a pioneer and a leader in

the profession of mining engineering in this country, and an active friend and valued trustee of the University from its early days until his death.

Christmas-Saucon Hall

Christmas-Saucon Hall is a three-story stucco building. It contains the office of the College of Business Administration, the offices, lecture rooms, and recitation rooms of the departments of English, accounting, economics and sociology, and finance, University Counseling Center and the Director of Placement. Christmas Hall has historic interest as the first building of Lehigh University.

Coppee Hall

Coppée Hall is the headquarters of the College of Arts and Science. It contains the offices of the College of Arts and Science, a lecture room, and the offices and recitation rooms of the departments of German, Latin, Greek, romance languages, history and government, international relations, and fine arts.

Sayre Observatory

The Sayre Observatory was the gift of the late Robert H. Sayre, one of the original trustees of the University.

The observatory contains an equatorial telescope of six inches clear aperture and of eight feet focus, by Elvin Clark; a zenith telescope of four and one-half inches clear aperture; an astronomical clock by William Bond & Son; a meridian circle; a prismatic sextant by Pistor and Martins; an engineer's transit and a sextant by Buff and Buff. Students in practical astronomy receive instruction in the use of the instruments and in observation.

The land upon which the observatory stands, consisting of seven acres adjoining the original grant was presented to the University by the late Charles Brodhead, of Bethlehem.

The Packer Memorial Church

The Packer Memorial Church, in which religious services are held, was the gift of the late Mrs. Mary Packer Cummings, daughter of the founder of the University. It was built in 1887. Occasional musical recitals and the annual Bach Festival are held in this building.

The University Library

The University Library is a five-story building of native stone, with limestone trim, in the collegiate Gothic style of architecture. It incorporates the original library building, erected in 1877 by Asa Packer and named in memory of his daughter, Lucy Packer Linderman, and a completely modern edifice built in 1929 with funds contributed by alumni.

The main floor of the new portion of the building is occupied by the general reading room with its two alcoves, offices of the library staff, and the lobby, where are located the loan desk, card catalogue, and serial indexes. On the upper floors of this portion of the building are eleven seminar rooms, the Treasure Room, the Lehigh Collection, and the Lehigh Art Gallery. On the ground floor is the Browsing Room, a large pleasant room furnished with easy chairs and an assorted collection of books, where students may read in an atmosphere of relaxation. The remainder of the new wing and the entire older portion of the building are occupied by stacks. In the stacks are a number of cubicles, which may be reserved by students and faculty members engaged in special work.

Eugene Gifford Grace Hall

Eugene Gifford Grace Hall, named for the donor and devoted to sports and recreation, is a stone edifice, approximately 120 feet wide and 180 feet long. The building contains a sports theater, which also serves as an assembly room for the University, with a seating capacity of about 3000, and a large drill floor, which is also available for the larger University dances and receptions. In addition, there are rooms for the band, orchestra, and athletic teams, and classrooms and offices for the departments of Air and Military Science and Tactics. Promenade terraces at the level of the dance floor on three sides of the building afford views over the Lehigh Valley and of South Mountain.

Dravo House

Dravo House, a five-story fireproof dormitory completed in April, 1948, provides accommodations for 340 students. The building was made possible by the alumni and friends of the University through their contributions to the Progress Fund. Each

of the four wing structures which compose the building has its own lounge and game rooms; and the center unit has a lounge and reception room for visiting friends, in addition to a ladies' lounge. There are rooms for two, three, and four students. Rates for each occupant range from \$80.00 to \$120.00 per semester.

The Henry Sturgis Drinker House

The Henry Sturgis Drinker House, a four-story fire-proof dormitory completed in September, 1940, provides accommodations for 194 students. It has rooms for two and three, suites for four, a spacious lounge, and a reception room for visitors. Rates for each occupant range from \$50.00 to \$90.00 a semester.

The Henry Reese Price House

The Henry Reese Price House, named in honor of Dr. Henry Reese Price, an alumnus of the University of the class of 1870 and late president of the board of trustees, furnishes dormitory accommodations for fifty-four students. The rates vary from \$25.00 to \$60.00 a semester.

The Charles Russ Richards House

The Charles Russ Richards House, which was completed in September, 1938, is a four-story fire-proof dormitory with rooms for two and three and suites for four students. In addition to bedrooms and studies accommodating a total of 217, the building contains an adequate recreation room, a spacious lounge, and two reception rooms for visiting friends. The rates are \$50.00 to \$90.00 per semester for each occupant.

The Charles Lewis Taylor House

The Charles Lewis Taylor House, the gift of Mr. Andrew Carnegie, is a three-story concrete dormitory with accommodations for 218 students, the majority of whom are housed in three-room suites, four to each suite. The building was named Taylor Hall by Mr. Carnegie in honor of Charles L. Taylor, his former partner in business, a graduate of the University of the class of 1876 and a trustee of the University. Room rent in this dormitory is from \$25.00 to \$60.00 per semester.

Drown Memorial Hall

Drown Memorial Hall was erected by friends and alumni as a memorial to the late Thomas Messinger Drown, LL.D., president of the University from 1895 to 1904. The building is devoted to the social interests of the University family. It contains study, reading, and lounging rooms, an assembly hall, the offices of Arcadia (student governing body), the student radio station WLRN and of the college publications, and club rooms for the dramatic and musical organizations. It also houses the scores, records, and phonograph of the College Music Set, the gift of the Carnegie Foundation.

Alumni Memorial Building

The Alumni Memorial Building, which is used as the administration building of the University, was erected as a memorial to 1,921 Lehigh men who served in World War I and especially to the forty-six who gave their lives. The cost of erection was raised by subscription from about 1,700 alumni. The Memorial Hall contains the records of the Lehigh men who served and those who died, together with mementos of the war.

In the south wing of the building are the offices of the president, vice president, dean of students, registrar, and superintendent of buildings and grounds. The north wing contains the offices of the bursar, director of admissions, accountant, public relations, alumni association, and supply bureau.

Taylor Gymnasium and Field House

In 1913, Charles L. Taylor, E.M., '76, donated to the University the funds required for the erection of a gymnasium and field house. These buildings are being remodeled, reequipped and expanded currently as one of the major projects of the Lehigh Progress Fund. All facilities will be ready for use in the Fall of 1950.

Taylor Gymnasium, which adjoins the athletic field, is a building 222 feet long and 73 feet wide. It has been expanded by the addition of a new swimming pool measuring 75 by 42 feet, and a new gymnasium measuring 94 by 77 feet. The new swimming pool ranges in depth from five to ten feet, and includes a large gallery for spectators, an observation room below the water line and the latest filtration equipment.

Included in the renovations of the old buildings and in the new construction are locker facilities for 2600 students, a faculty locker room, coaches' locker room, five basketball courts, boxing room, fencing room, golf practice room, wet and dry steam rooms, and a specially designed wrestling room. Also included are a well equipped first aid room for physical education activities, corrective exercise gymnasium, modern trainer's room with latest facilities, and class and meeting rooms.

Athletic, physical education and business offices have been incorporated in the new construction. Improved heating is furnished by electric blowers.

The former entrance way has been transformed into a trophy room measuring 26 by 55 feet as a repository for athletic prizes and awards. The third floor addition known as the Samuel E. Berger Room, the gift of Mr. Samuel Erwin Berger, B.A., '89, has also been remodeled.

Taylor Field

An athletic field more than nine acres in area is provided for the accommodation of students who participate in the various outdoor sports. The stadium, located on the lower level, provides football and baseball fields, surrounded by concrete stands having a seating capacity of 12,000. On the upper level there is a practice field for football, baseball, lacrosse, and soccer; also a quarter-mile track and a 220-yard straight-away. During the winter months a wooden outdoor running track, twelve laps to the mile, is provided.

Lehigh Field and Field House

An additional athletic field seven and one-half acres in area, with field house, gymnasium, and covered grandstand, is located about a mile from the University campus. The field house has dressing rooms, lockers, and shower baths; the gymnasium is equipped with basketball and volley ball courts. Here are eleven tennis courts for intercollegiate and intramural tennis. This field includes a playing ground for intercollegiate soccer and a field for intramural baseball and other intramural activities.

Lamberton Hall

The first floor of this building contains the main dining hall for student use and a private dining room, together with a complete kitchen and cafeteria counter. The second floor has a large dining room, pantry and service rooms. Storerooms and service rooms for help are located in the basement.

A portion of the basement is used by the military department as a rifle range. This portion contains two indoor rifle and pistol ranges.

The James Ward Packard Laboratory of Electrical and Mechanical Engineering

The late James Ward Packard, who was graduated from Lehigh University in 1884 with the degree of mechanical engineer, the designer of the first Packard motor car and founder of the Packard Motor Car Company of Detroit, Michigan, and of the Packard Electric Company of Warren, Ohio, donated \$1,200,000.00 for the erection and equipment of an electrical and mechanical engineering laboratory, which was completed in 1929.

This building, named for the donor, is a five-story steel-framed sandstone structure 225 feet long and 180 feet wide. The lobby is finished in Italian travertine. The halls throughout the building are wainscoted with Tennessee marble. An auditorium on the first floor with a seating capacity of 622 is equipped with still- and motion-picture apparatus.

The western half of the building contains the offices, class rooms, research rooms, and laboratories of the department of electrical engineering. The main dynamo laboratory contains more than 100 generators and motors of various types. The high-tension laboratory is equipped with a 150 kv. and a 60 kv. testing transformer, a 700 kv. oscillation transformer, and a source of high direct current voltage up to 100 kv. The transients laboratory is provided with six magnetic oscillographs, two cathode-ray oscillographs, two artificial transmission lines, a surge generator, and a photographic dark room. A five-unit harmonic phase-shifting motor-generator set supplies voltage of various frequencies and wave forms for special tests. The communications laboratory has extensive equipment of high-frequency measuring apparatus, vacuum-tube circuits, speech amplifiers, and a 40/80 meter trans-

mitter (C.W. or phone) used by the radio club. The wiring system provides for quick communication and inter-connection between any two parts of the building. Transforming machinery and switchboard for the laboratory power supply are located in the basement.

The eastern half of the building houses the departments of mechanical and industrial engineering, with class rooms, drawing rooms, offices, research rooms, photographic dark room, shop, instrument room and laboratories.

The main laboratory contains steam power equipment, including boilers, steam engines, turbines, condensers, heaters, pumps, etc. The equipment is arranged so that tests may be made of a complete steam power plant or tests may be made of individual components. In addition, reciprocating air compressors, a ventilating fan and a high-pressure centrifugal blower are available.

The internal combustion engine laboratory has a number of automotive-engines, both spark-ignition and compression-ignition types, set up for testing with an electric dynamometer. A Cooperative Fuel Research single cylinder engine is used for investigation-al tests. Two two-stroke supercharged marine diesel engines are set up with a hydraulic dynamometer. A small single-cylinder diesel engine, connected to an electric generator is also available.

The refrigeration laboratory includes a small Freon-12 condensing unit connected to an electric calorimeter load. The compressor can also be tested on a gas recirculation cycle.

The instrument room has a complete supply of portable instruments. The shop has facilities for maintenance and for construction of new equipment, instruments, and models.

Courses in machine design at the graduate and undergraduate levels emphasize important experimental techniques. For work in experimental stress analysis a 60,000 lb. universal testing machine is available, along with strain gage equipment, oscilloscopes, Stress-coat and a polariscope for photoelastic investigations. For vibration and balancing studies, the equipment includes vibration velocity meters, a displacement indicator, recording vibrometer, electromagnetic torque meter and portable balancing equipment.

Sayre Park

A development of the mountainside on the University grounds was affected through the donation in 1909 of the sum of \$100,-

000.00 by the children of the late Robert H. Sayre, to be used in the development of Sayre Park as a memorial to their father, who was a trustee of the University from its foundation until his death in 1907.

The Arboretum

The Arboretum is a tract of about eleven acres adjoining Sayre Park. It was established by a friend of the University as a tree nursery for the purpose of furnishing illustrative specimens of American trees and of cultivating trees and shrubs for the beautifying of the park. All of the more important species of North American trees are to be found in the Sayre Park and the Arboretum. A tract of seven acres adjoining the Arboretum has been planted with a variety of indigenous trees as an exhibition growth of tree culture.

The Health Center

The Health Center, where the Students' Health Service is housed temporarily, is a rebuilt one-story frame structure, 151 feet long and 26 feet wide. In addition to offices and rooms for the personal use of members of the staff, the building contains a main and an auxiliary dispensary, a laboratory, an X-ray room, an ultra-violet room, dark rooms, a physiotherapy room, a sterilizing room, an audiometer room, and a large waiting room.

The Education Building

The Education Building, headquarters of the department of education, is a rebuilt, temporary one-story frame structure, 76 feet long and 30 feet wide. The building has a class room with a capacity of approximately thirty, a seminar room, and six offices.

The Ordnance Laboratory

The facilities of the Departments of Air and Military Science and Tactics, located in Eugene Gifford Grace Hall, have been augmented by a temporary one-story frame structure, 60 feet long and 25 feet wide. This building contains Army and Air Force ROTC supply storage facilities and garage space.

Temporary Dormitories

Three rebuilt quonset-type frame buildings, each 125 feet long and 21 feet wide, provide temporary study and sleeping quarters for 120 students. A one-story concrete-block boiler room has been erected to supply heat for these three buildings.

Storage Buildings

Two rebuilt steel quonset huts, 96 by 20 feet, have been secured for use as storage buildings and work shops.

SUMMARY OF STUDENT REGISTRATION

Spring 1950 ✓

Students in the University

Undergraduate Students	2662
Graduate Students	366
Adult Education Students	224
Total	3252

Students in Undergraduate Curricula

Curriculum	Seniors	Juniors	Sophomores	Freshmen	General Coll. Division	Total
Arts and Science	125	119	124	159	—	527
Business Administration	169	166	154	155	—	644
Chemical Engineering	41	55	60	60	—	216
Chemistry	13	16	16	20	—	65
Civil Engineering	29	41	35	65	—	170
Electrical Engineering	79	70	48	61	—	258
Engineering Physics	19	18	20	19	—	76
Industrial Engineering	58	43	49	57	—	207
Mechanical Engineering	87	70	63	108	—	328
Metallurgical Engineering	23	22	26	27	—	98
Mining Engineering	8	15	20	15	—	58
General College Division.....	—	—	—	—	15	15
Total	651	635	615	746	15	2662

REGISTRATION STATISTICS

Summer 1950
Students in the University

Undergraduate Students	581
Graduate Students	177
Adult Education Students.....	183
Total	941

Fall 1950
Students in the University

Undergraduate Students	2799
Graduate Students	403
Adult Education Students.....	216
Total	3418

Students in Undergraduate Curricula

Curriculum	Seniors	Juniors	Sophomores	Freshmen	General Coll. Division	Total
Arts and Sciences.....	120	134	150	130	—	534
Business Administration	158	199	169	188	—	714
Chemical Engineering	45	61	61	72	—	239
Chemistry	16	15	15	21	—	67
Civil Engineering	34	31	48	70	—	183
Electrical Engineering	63	59	58	68	—	248
Engineering Physics	15	20	15	20	—	70
Industrial Engineering	37	60	58	65	—	220
Mechanical Engineering	70	62	84	109	—	325
Metallurgical Engineering	21	25	37	31	—	114
Mining Engineering	13	13	25	19	—	70
General College Division.....	—	—	—	—	15	15
Total	592	679	720	793	15	2799

GEOGRAPHICAL DISTRIBUTION OF STUDENTS

Spring 1950 ✓

Alabama	3
Arizona	1
Arkansas	1
California	6
Colorado	1
Connecticut	58
Delaware	13
District of Columbia	14
Florida	9
Georgia	1
Illinois	12
Indiana	3
Iowa	3
Kentucky	1
Maryland	34
Massachusetts	19
Michigan	10
Minnesota	2
Missouri	2
Montana	4
Nebraska	1
New Hampshire	7
New Jersey	743
New York	476
North Carolina	5
Ohio	44
Pennsylvania	1712
South Carolina	1
Vermont	1
Virginia	7
Washington	1
West Virginia	5
Wisconsin	4
Australia	1
Burma	3
Chile	1

REGISTRATION STATISTICS

China	6
Colombia	1
Costa Rica	1
Cuba	1
Czechoslovakia	1
Denmark	1
Dutch West Indies.....	3
England	1
Germany	2
Greece	1
Guatemala	1
Hawaii	3
India	3
Korea	1
North West Indies.....	1
Norway	1
Palestine	1
Philippines	1
Siam	1
Sweden	1
Switzerland	2
Turkey	2
Venezuela	5

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3256

GEOGRAPHICAL DISTRIBUTION OF STUDENTS

Fall 1950

Alabama	2
California	5
Connecticut	75
Delaware	17
District of Columbia.....	10
Florida	11
Georgia	1
Illinois	7
Indiana	3
Iowa	3

Kansas	1
Kentucky	1
Maine	1
Maryland	39
Massachusetts	24
Michigan	8
Minnesota	1
Missouri	3
Montana	4
Nebraska	2
New Hampshire	5
New Jersey	799
New York	558
North Carolina	2
Ohio	48
Pennsylvania	1700
Rhode Island	2
South Carolina	2
Texas	4
Vermont	1
Virginia	12
Washington	2
West Virginia	7
Wisconsin	4
Wyoming	2
Australia	1
Austria	1
Burma	2
Canada	1
Canal Zone	1
China	5
Colombia	1
Costa Rica	2
Cuba	2
Czechoslovakia	1
Denmark	1
Dutch West Indies	3
Hawaii	5
Holland	2
Great Britain	2

REGISTRATION STATISTICS

Germany	4
India	2
Jordan	1
Malaya	1
Philippines	1
Siam	1
Switzerland	2
Turkey	3
Venezuela	7

REFERENCE LIST OF OLD AND NEW COURSE NUMBERS

REFERENCE LIST OF OLD AND NEW COURSE NUMBERS

***Courses Dropped

OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW
Accounting		153	353	179	179	285	485	235	422
1	1	155	355	190	190	286	486	236	440
2	2	158	358	192	192	288	488		
4	104	161	361	194	194	289	489		
6	106	203	403	197	197			Mechanics	
113	213	207	407	200	400			1	1
114	214	208	408	201	401	Civil		2	2
115	115	209	409	202	402	Engineering		3	3
118	218	210	410	203	403	2a	60	11	111
119	219	211	411	220	440	3	61	12	112
120	220	212	412	221	441	6	***	13	113
171	271	213	413	230	430	6a	40	21	121
172	272	230	430	231	431	15	150	23	123
		256	456	232	432	16	42	101	302
		260	460	—	433	29	100	—	321
Economic		262	462	236	436	30	106	125	225
Statistics		263	463	237	437	31a	41	126	226
145	145	264	464	249	449	35	43	201	402
146	246	265	465	252	452	41a	102	231	421
147	247	266	466	258	458	100	105		
148	248	267	467	259	459	101	101	Classical Lang.	
152	252	268	468	260	460	110	104	Greek	
171	271			261	461	113	103	1	1
172	272			263	463	118	151	2	2
		Chemistry		266	466	119	152	3	3
		4	4	271	471	120	351	4	4
Law		5	5	272	472	121	153	7	7
1	101	15	15	273	473	122	353	8	8
2	102	16	16	290	490	124	350	9	9
103	103	35	35	291	491	128	160	10	10
		36	36	293	493	129	161	11	111
Biology		38	38	295	495	131	360	12	***
1	1	91	91	297	497	133	140	13	***
3	3	92	92	298	498	135	301	15	***
4	4	93	93	299	499	136	340	16	116
6	6	Ch.E.				141	320	21	21
11	***	99	176			142	321	83	183
13	13	—	100	Chemical		201	450	99	99
14	***	185	175	Engineering		202	451	100	200
15	15	102	302	—	100	203	403	121	***
16	16	134	334	70	170	207	460	181	202
18	18	135	335	78	171	208	461	201	***
20	120	137	337	79	172	209	456	202	***
21	***	139	339	80	160	210	457	203	***
22	***	144	344	Chem.		211	455	204	***
23	***	145	345	99	176	212	400	205	***
31	31	150	150	180	173	213	404	206	***
32	32	151	151	181	174	214	401		
33	33	156	356	183	301	216	454		
34	34	157	357	—	302	217	441	Latin	
36	36	158	358	180	175	218	***	1a	***
50	50	165	165	186	300	219	405	1b	65
52	52	167	167	280	480	221	452	2	66
55	***	168	368	281	481	222	453	4	67
61	61	169	***	282	482	225	402	13	68
62	62	171	371	283	483	232	420	22	22
106	206	172	***	284	484	233	421	31	61
113	313							32	62

OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW
33	63	54	154	103	120	134	334	51	153
34	64	56	156	117	111	135	335	123	223
84	184	121	321	131	331	136	336	124	224
105	169	130	330	132	332	137	337	127	***
106	106	131	331	133	133	138	338	128	***
107	***	140	440	134	334	141	***	131	231
108	108	150	350	135	335	220	420	132	232
109	***	151	351	136	336	221	421	141	241
121	***	160	360	137	337	222	422	142	242
—	170	171	371	138	338	227	427	151	251
122	***	173	373	141	141	229	429	152	252
125	201	190	390	142	142	230	430	154	254
182	203	191	391	143	143	231	431	171	271
201	***	192	392	144	144	232	432	172	272
202	***	219	419	147	345	233	433		
203	***	220	420	209	441	234	434	Fine Arts	
205	***	222	422	210	442	235	435	3	3
207	***	223	423	211	437	236	436	4	4
208	***	243	443	212	438			5	5
209	***	244	444	213	435	Speech		6	6
		246	446	214	436	30	30	—	7
Economics		247	447	219	443	31	31	—	8
1	1	A-F	A-F	220	444	32	32	11	11
3	3	253	453	223	433	33	33	12	12
4	4	254	454	224	434	—	34	13	13
11	111	256	456			51	51	14	14
15	115	257	457	English		52	52	17	17
50	50	258	458	0	0	61	61	18	18
60	160	263	463	1	1	62	62	25	25
106	206	264	464	2	2	151	251	26	26
107	207	266	466	3a	11	160	260		
108	208	268	468	3b	12	161	261	Geology	
113	113	272	472	4	4			1	1
114	214	282	482	5	5	Journalism		3	3
133	233	a-b	A-B	7	7	1-8	1-8	4	4
134	234	283	483	8	8	11	11	6	6
135	235	284	484	9	9	12	12	12	12
136	236	291	491	18	18	13	13	31	31
171	271	292	492	19	19	14	14	32	32
172	272	293	493	20	20	15	15	33	33
		294	494	21	21	16	16	35	35
Sociology		295	495	35	35	17	17	111	311
—	41	296	496	36	36	18	118	112	312
—	44			41	41	20	120	121	223
51	***	Electrical		42	42	21	21	131	331
161	42	Engineering		81	181	22	22	132	332
162	262	23	***	82	182	23	23	141	141
—	263	24	100	83	183	25	25	142	342
—	264	32a	2	84	184	26	26	143	43
—	266	33a	3	117	117	31	31	144	344
171	271	34	104	118	318	32	32	—	146
172	272	35	105	120	320	43	43	151	255
		36	106	121	321	101	201	152	256
Education		37a	107	122	322			161	361
0	0	38	108	123	323	Finance		162	362
A	A	39	109	124	324	25	125	171	371
1	1	40	110	125	325	26	126	172	372
20	20	60	160	126	326	29	129	181	181
51	152	61	161	131	331	30	130	182	182
53	153	62	162	133	333	33	133	202	402

OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW
211	411	160	360	122	322	112	322	124	320
212	412	201	***	125	325	115	315	125	331
213	413	202	***	126	326	123	123	126	***
214	414	203	***	127	327	124	324	127	341
221	421	204	***	128	328	131	233	129	342
232	432	205	***	129	329	140	340	144	334
233	433	206	***	130	330	141	341	200	420
234	434	207	***	200	400	201	401	201	421
241	441	208	***	201	402	—	405	203	433
251	451	210	***	International Relations		—	406	204	435
252	452	211	***			209	409	207	436
253	453	212	***			210	410	208	432
254	454	213	***	1	1	211	***	211	403
281	481	214	***	2	2	212	***	212	404
282	482	215	423	11	11	216	416	216	422
German		216	424	12	12	217	417	217	***
		217	431	21	21	218	418	220	442
		218	432	22	22	223	423	230	***
1	1	219	403	31	133	224	424	—	431
2	2	220	404	32	134	229	429	—	433
3	3	227	401	112	312	230	430	—	440
4	4	228	402	122	322	231	431	—	441
7	7	245	425	132	332	235	435		
9	9	246	426	141	341	236	436		
10	10	247	427	142	342	241	441		
22	22	248	428	151	351	242	442		
111	211	—	411	152	352	250	450		
112	212	—	412	161	361	253	453		
113	13	—	413	162	362				
114	14	—	414	241	441				
115	215	—	421	242	442				
116	216	—	422	251	451				
History		Government		252	452				
				261	461				
				262	462				
11	11	Government		Mathematics		Mechanical Engineering		62	112
12	12							78	***
13	13							81	68
14	14	1	1	1	1	3	1	91	191
25	25	51	51	1b	1b	10	106	91	191
26	26	52	52	11	11	11	107	108	308
27	27	151	351	12	12	14	108	125	105
28	28	157	357	13	13	15	110	130	230
29	29	160	360	14	14	18	109	131	231
30	30	163	363	15	15	19	161	135	135
115	315	164	364	16	16	21	162	138	338
116	316	251	451	23	23	22	104	152	352
117	317	252	452	24	***	23	105	—	358
118	318	263	463	40	40	25	163	163	363
119	319	264	464	42	42	29	160	164	364
120	320			43	43	—	166	175	375

LEHIGH UNIVERSITY

OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW	OLD	NEW
221	421	16	4	222	***	16	16	41	41
222	***	20	100	231	***	22	22	42	42
223	423	21	101	232	***	51	100	101	221
225	425	22	202			102	302	102	222
	PD	103	203		Physics	104	304	103	223
—	102	104	204	12	12	108	308	104	224
	PD	105	206	16	16	109	309	201	***
—	102	106	205	17	17	111	111	202	***
		107	207	22	22	112	112	203	***
	ROTC	108	254	23	23	113	313	204	***
Mil	MS	211	411	24	24	114	314	211	***
1	1	212	412	50	100	115	***	212	***
2	2	213	413	61	191	116	***	213	***
3	3	214	414	110	110	117	317	214	***
4	4			111	111	120	320		
5	5		Engineering	120	315	129	329		Italian
6	6		Geophysics	122	252	136	335	1	1
7	7	101	201	124	314	151	351	2	2
8	8	102	202	126	340	152	352	11	11
13	13	103	301	132	363	154	354	12	12
14	14	104	302	160	268	203	403		
15	15		Music	161	269	204	404		Portuguese
16	16	1-8	1-8	162	212	205	405	1	1
17	17	11	11	163	213	206	406	2	2
18	18	12	12	164	192	209	409		
23	23	13	13	165	193	210	410		Spanish
24	24	14	14	166	372	211	411	1	1
25	25	17	17	167	472	212	412	2	2
26	26	18	18	168	171	214	414	11	11
27	27	20	20	170	362	—	407	12	12
28	28			201	441			21	21
			Philosophy	202	440		Religion	22	22
Mil	AS	3	3	207	452	11	11	31	31
—	1	14	14	208	***	12	12	32	32
—	2	15	15	214	424	13	13	101	221
53	3	71	171	215	425	14	14	102	222
54	4	72	172	216	476	15	15	103	223
55	7	81	181	220	420	16	16	104	224
56	8	91	191	221	421	17	17	111	231
57	9	92	192	222	422	18	18	112	232
58	10	131	231	223	423	—	19	201	***
63	3	132	232	226	465			202	***
64	4	137	237	227	467		Rom. Lang.	211	***
65	11	138	238	231	428		French	212	***
66	12	139	239	232	429	1	1		Physical
67	13	151	151	241	464	2	2		Education
68	14	161	261	260	474	11	11	1-8	1-8
		201	***	261	475	12	12	22	22
	Mining	202	***	291	491	13	13	23	23
	Engineering	205	***	292	492	14	14	24	24
6a	2	206	***			21	21	30	30
10	252	211	***		Psychology	22	22	31	31
12	252	212	***	1	1	31	31	32	32
15	161	221	***	4	4	32	32		

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